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Fire and Fuels Report

Pine Mountain LSR Enhancement and Protection Project

Upper Lake Ranger District, Mendocino National Forest
Lake County, CA

Prepared By: Hinda Darner
Fuels Officer

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1.1 INTRODUCTION

This report analyzes and summarizes the condition of wildland fuels and potential fire effects of the Pine Mountain Late-Successional Reserve Habitat Protection and Enhancement Project.

Refer to the Pine Mountain EIS for further informtaion on the Proposed Action and Alternatives.

1.2 Purpose and Need

From our analyses, we have concluded that a need exists to reduce hazardous fuels in order to restore wildfire resiliency to the project area. A majority of the area has departed greatly from its historical fire regime, which has contributed to excessive fuel loading and overly dense stands. These conditions put the Pine Mountain LSR at risk of habitat loss and other undesirable effects from wildfires as well as pose safety concerns to resources on fires during suppression activities. The accumulation of forest fuels directly increases a wildfire's intensity and severity, which may, in turn, result in suppression strategies that further degrade LSR habitat components.

1.3 Desired Condition

Guidance from the Mendocino National Forest Land and Resource Management Plan (LRMP):

Land management activities on the Upper Lake Ranger District are directed by the Mendocino National Forest (MNF) Land and Resource Management Plan (LRMP), dated February 1995. This document specifies forest-wide standards and guidelines, as well as area-specific guidelines. Regarding fuels treatments and fire hazards, it directs (Section IV- Management Direction: Fire and Fuels, pg 20-21):

> Maintain a cost effective detection, prevention, suppression, and fuels management program mix in support of other resource programs. (MNF LRMP IV-2)
>
> In order to accomplish that goal, the LRMP emphasizes "fuel treatment efforts for fire hazard reduction purposes in the following areas:
>
> Natural fuels:
>
> - Continuous, mature brush stands of more than 150 acres adjacent to or within areas of urban interface, resource investments, or high fire hazards;
> - Continuous, mature brush stands more than 25 years old;
> - Continuous, mature brush stands with dead-to-live ratios greater than 35%.
> - Forested areas with excessive accumulations of natural fuels.
>
> Activity fuels:
>
> - In zones of urban interface or other high fire hazard areas

Guidance from the Mendocino National Forest Late Successional Reserve Assessment (LSRA):

The Mendocino National Forest LSRA provides the following guidance:

- The objective for management of late succesional reserves is to protect and enhance late successional forests to provide habitat for populations of species dependant on late successional and old growth forest ecosystems (ROD). LSRA p9
- Mid-to-late succesional pine, mixed conifer and hardwood stands are capable of enduring the effects of a mid-summer wildfire under normal severe conditions without setting the stand back to an earlier successional stage. (MNF LSRA p9)
- The LSRA (p41) describes undesirable wildfire effects as tree mortality >25%. Fuel management strategies and techniques that reduce the intensity of wildfires, limit flame lengths to less than four feet, and reduce the likelihood of crown fires would reduce tree mortality to less than 25% and maintain late successional habitat. LSRA p35
- Fuelbreaks should be constructed to provide safe access for fire suppression actions, prevent crown fires on major ridges to reduce potential for long spotting distances, and to facilitate future prescribed burning operations.
- Underburning designed to change a fuel model 10 to a fuel model 8 would reduce flame lengths.
- Moving MFRI towards a more historical level would increase the LSR's resiliency to wildfire events. Reducing the number of acres that would experience (under wildfire conditions) flame lengths over four feet and reducing number of acres that would experience canopy fires that lead to tree mortality would help protect the LSR from potential widlfires by reducing mortality to the less than 25% goal as described in the LSRA as a desired condition.

1.4 METHODOLOGY

Detailed Methodology

The FlamMap software program was utilized to focus primarily on fuels and potential wildland fire behavior. The alternatives were analyzed to estimate Fire Types and Flame Lengths.

Expected flame lengths under 97th percentile weather conditions provide a quantitative measure of the expected intensity of fire within the analysis area. As discussed above, fuels treatments that limit flame length to less than four feet are likely to reduce fire intensity, limit tree mortality, provide a greater measure of safety for firefighters, and enhance the cability of fire managers to use fire suppression strategies that are less disruptive to ecosystems. Using the FlamMap software, the number of acres that exhibited 4 foot and less flame lengths were compared for all the alternatives addressed.

Expected fire type (Surface fire or Canopy fire) provide an estimate of the amount of overstory mortality that would be expected in the analysis area if a fire occurs under 97th percentile weather conditions. The FlamMap software was used to compare percentages of areas experiencing torching, crowning and surface fires for all the alternatives addressed.

In addition to the FlamMap predictions, the mean fire return interval (MFRI) provides us with a historical reference to compare current conditions to. Landfire Data was used to derive historical pre-suppression MFRI's for the project area.

1.5 AFFECTED ENVIRONMENT

AREA DESCRIPTION

The Project Area is located on the Upper Lake Ranger District. Treatments are proposed on approximately 8,000 acres southwest of Lake Pillsbury in the Pine Mountain vicinity. The Planning Area is approximately 10,200 acres in size and comprises both Late Successional Reserve (LSR) and Matrix land designations. The proposed area lies primarily within the County of Lake with approximately 70 acres in Mendocino County.

FIRE

Fire Threat/Hazard

The majority of the Pine Mountain Late Successional Reserve project area lies adjacent and upslope to the western boundary of the forest and contains numerous parcels of private property. As described in the LSRA there is a significant threat of wildfire entering the LSR from outside the Forest, especially from the West (pA4-18) as these areas are not under Federal management. In addition to the threat from the western boundary, extensive areas of private ownership occur in and around the project. Potential ignition risk sources include human causes as well as lightning causes, the latter of which ignited the Back Fire, burning approximately 1500 acres inside the Pine Mountain project area. Lake Pillsbury is a highly recreated area as well, increasing the potential for a human caused fire whether from camping, hunting or other recreation related activity. Pine Mountain Lookout is rented out to the public during the summer months, and is occupied almost daily during that time. Several dispersed camping areas occur and are used during summer months especially during deer hunting season.

FIRE HISTORY

The LSRA gives Pine Mountain LSR an overall Moderate fire risk rating. It also breaks down risk into the following four hazard ratings: 191 acres of very high, 2713 acres of high, 8356 acres of moderate and 199 acres of low ratings. The risk rating was done at a watershed level and projected 1 fire every 20 years per thousand acres. However, since the LSRA was completed in 1995 and is over 20 years old, this data is outdated and additional analysis was conducted on fire history for this report and is discussed in the following section.

The following fire history analysis was done by the district for the purpose of this report. This assessment incorporates more recent fires not reflected in the 1995 LSR assessment. Based on available fire records, approximately 66 natural and human caused fires have occurred in or around the Pine Mountain LSR project area between 1927 and 2008. This averages to approximately 7.75 fires per decade. 16 out of the 66 fires listed were large fires (over 50 acres in size) Out of these 66 ignitions 48 were human caused, 12 were lightning caused and 6 were of unknown ignition sources. Fires that started, entered or had a reasonable chance of entering the project area (based on previous fire history or topography/vegetation) were included in the fire history table and this analysis. Fires near the project area were included if there was a good chance that the fire (had it not been suppressed) could have or did burn into the Project Area.

Table 1 shows the forest fire history records for the project area. Figure 1 is a map of the fire history for the Pine Mountain project area. Table 2 shows State Response Areas (SRA) and Local Response Areas (LRA) fire history west of the project in the Potter Valley area. Local experience shows that fires that exceed 10 acres usually escape initial attack

It is important to consider several things in regard to the fire history of the area. These include the number of fire starts that have occurred within and near the project area but were suppressed at a small size of less than 10 acres (Figure 1 and Tables 2 and 3); the number of large fires surrounding the project area; and current conditions that are conducive for a large fire with high severity effects. Departure from its historical fire regime has resulted in lack of historically low intense but more frequent fires which in turn has created fuels conditions that are likely to cause high severity wildfire effects within a majority of the LSR. The fire history shows how many starts there have been that were successfully suppressed. Any of these fires could have become larger fires as historical evidence (Figure 1) shows that there has been a trend of large fires on the MNF. Many of these fires have had significant areas of moderate to high severity fire damage (see Forks, Spanish, North Pass, Mill). The conditions in the Pine Mountain project area allow for intense wildfires that would be a threat to the Late Successional Reserve.

In most of these large fires, portions burned at higher intensities than they would have historically under a fire regime with more frequent but lower intensity fires. Recent examples of such fires are the Yolla Bolly and Soda Complexes in 2008, the Hunter Fire in 2006, the Spanish Fire in 2003 and the Fork Fire in 1996. The severity of effects from these fires were likely a result of the forest's departure from historical fire regimes where fires burned more frequently but with less intensity and less damage to natural resources.

The Back Fire was an early fire season burn and was not representative of the effects that a mid-fire season burn would have had in that same area. The Back Fire does have areas affected by high intensity fire, but less so than other fires that have occurred later in the season when vegetation is drier. A burn mid-fire season would likely have had much larger areas of high intensity burning than the 2008 Back fire exhibited in June. See Table 4 for a comparison in weather of the Back Fire during its main burning periods vs weather conditions under 97th % weather conditions. The weather conditions were more
favorable for lower fire activity than the 97th percentile weather conditions would have been. Therefore it can be expected that if the Back Fire burned during the midst of fire season instead of in June, when conditions were milder, it would have likely burned with higher intensities. In addition, the Back Fire area was revisited to reassess conditions. The images in Figure 2 show the different ranges of effects from the June back fire. It is important to note that it is expected that a fire in July or August would have burned with even higher intensities.

Figure 1 Fire History Map

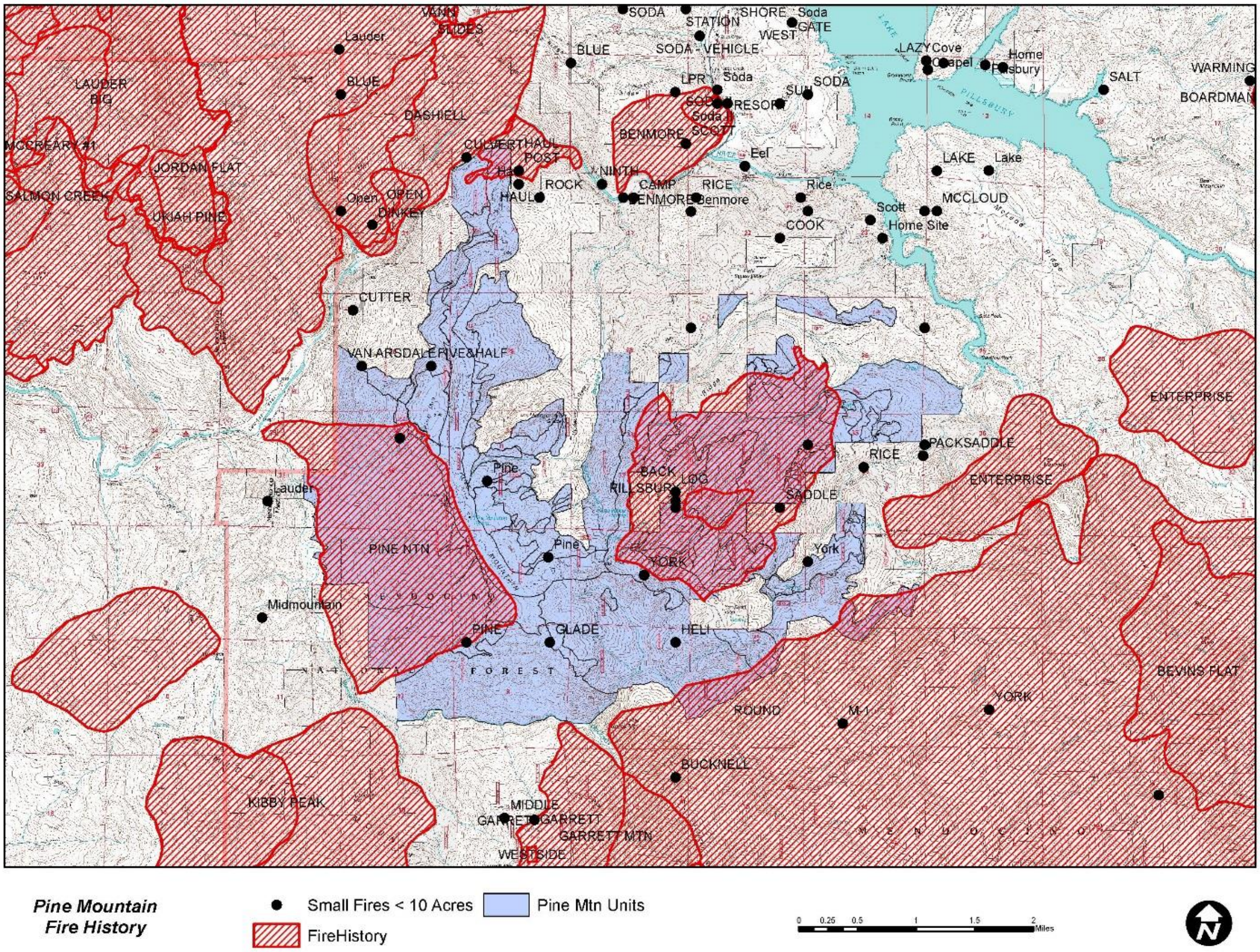


Table 1 – Fire History

Fire History Table							
Date	Name	Size (acres)	Cause*	Date	Name	Size (acres)	Cause*
1928	Kibby Peak	1160	H	1990	Log	0.1	H
1928	Coyote Rock	803	H	1991	Rice	0.1	N/A
1929	Garrett	1,138	H	1993	Squaw	0.1	N/A
1930	Irishman Flat	803	H	1994	M-1	0.1	N
1932	Big Rock	1875	H	1994	Rice	0.4	N
1932	Pine Mtn.	1,739	H	1995	Eel	1	N/A
1939	Enterprise	1,477	H	1996	Pine	0.1	H
1944	Jordan Flat	11,787	H	1997	York	0.2	N
1944	Bevins Flat	3,142	H	1998	Benmore	0.1	H
1966	Round	20,847	H	1998	Camp	0.1	H
1970	Lauder	0.1	H	1998	Spring	6	H
1971	Benmore	395	H	1998	Haul	163	H
1975	York	0.1	H	1998	Haul 2	3	H
1975	Mid Mountain	5	H	1998	Haul 3	0.5	H
1975	Open	111	H	1998	Glade	1.5	H
1976	Cutter	0.1	H	1998	Rock	0.2	H
1976	Van Arsdale	0.1	H	1998	Post	0.1	H
1979	N/A	0.1	N	1998	Culvert	0.1	H
1980	N/A	0.1	H	1998	Soda 2	68	H
1980	N/A	1	H	1998	York	3	3
1984	N/A	3	H	1998	Rice	0.1	N/A
1984	N/A	0.1	N/A	1999	Scott	2	H
1985	N/A	0.4	H	1999	Homesite	0.2	H
1985	N/A	0.1	H	2002	Pine	0.3	H
1986	N/A	150	H	2003	Pack Saddel	0.3	N
1988	Cook	0.1	H	2003	Pillsbury	2	N
1988	York	79	H	2003	Garret	0.5	N
1988	Westside	15	N	2005	Middle 2	1	N/A
1989	Heli	0.2	H	2007	Mountain	1.2	H
1989	Five and Half	0.1	H	2008	Back	1567	N
1989	Middle	0.1	H	2008	Big	2193	N
1990	Pine	0.1	N				
1990	Saddle	0.1	H				
1990	Streeter	4	H				
1990	Bucknell	0.2	N				

Table 2 – CalFire MEU Fire History Table**

MEU (CalFire) Fire Starts West of Project			
Date	Name	Size (acres)	Cause*
1995	Sutphin	0.1	H
1995	Oatcob	0.1	N/A
1995	Mid Mountain	2	H
1997	Hopper	16	N/A
1997	Stroh	2	N/A
2002	Eel (MEU)	0.6	N/A
2004	Koerner (MEU)	1	H
2005	Van Arsdale (MEU)	0.2	N
2005	Pine (MEU)	2	N/A
2005	Van (MEU)	1	H
2007	MTN/CMD8/TAC2	1	H
2009	Irish	1	N/A
2010	Pine Av Potv	0.1	H

* H- Human Ignition N- Natural Ignition (Lightning) N/A- Unknown/Miscellaneous Ignition

** These fires were not included in the 66 fires used for the fire history analysis. This table shows the # of fire starts West of the project and East of the community of Potter Valley.

Figure 2 Back Fire Images Post Fire




Figure 3 – Back Fire Plots

Plot ID: EMFB 1

Site Location: N 39° 21.578’ X W 122° 59.370’

Elevation: 3603’ Aspect: W Slope: 18%

Transect Azimuth: 343° Fire History: Back Fire 2008

Vegetation Type: PSME PIPO PILA

Diameter (in)	# of intercepts	Loading (tons/ac)
< 0.25	128	2.66
0.26 – 1.0	9	3.24
1.1 – 3.0	10	13.36
3.1 – 6.0	9	14.97
6.1 – 9.0	3	19.12
9.1 – 20	0	0
20.1 >	0	0
Total	159	53.35

	Depth (in)	Depth (in)	Depth (in)	Average
Fuel Bed	23.0	12.0	21.0	18.67
Duff	1.0	1.0	1.0	1.0
Total	24.0	13.0	22.0	19.67

Plot ID: EMFB 2

Site Location: N 39° 21.580’ X W 122° 59.368’

Elevation: 3598’ Aspect: W Slope: 20%

Transect Azimuth: 351° Fire History: Back Fire 2008

Vegetation Type: PSME PIPO PILA

Diameter (in)	# of intercepts	Loading (tons/ac)
< 0.25	163	3.16
0.26 – 1.0	16	5.85
1.1 – 3.0	12	16.07
3.1 – 6.0	9	17.45
6.1 – 9.0	6	28.89
9.1 – 20	0	0
20.1 >	0	0
Total	206	71.42

	Depth (in)	Depth (in)	Depth (in)	Average
Fuel Bed	42.0	34.0	50.0	42
Duff	1.0	1.0	1.0	1.0
Total	43.0	35.0	51.0	43.0

8 Years Post Fire Plots (not all of the Back Fire looks like this. Some areas have very little fuel loading as seen in photos above. These plots are intended to show the higher end of fuel loadings that exist in portions of the Back Fire area.

Figure 4 - Forks Fire

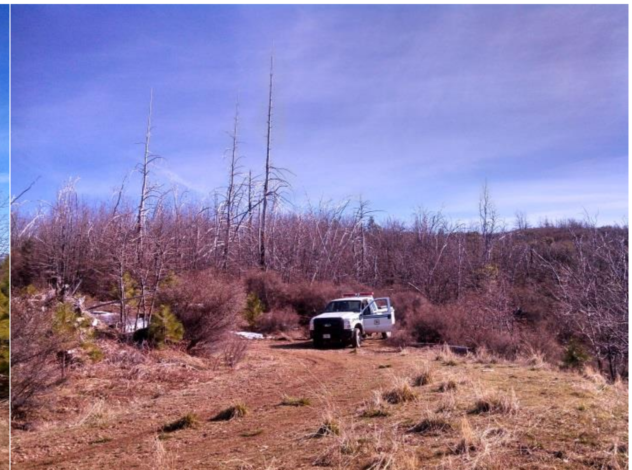
1a

1b

Figure 5

Image 1

Image 2



Examples of recent large fire severity on the MNF. 1: Forks fire of 1996. The aerial image (Figure 4, 1 and 2) show some of the effects that the fire had on the landscape. Many of the trees have already fallen to the ground, however the snags remaining show that a timber stand existed prior to the fire and has been replaced by brush and large areas of knobcones. The green trees in the picture are primarily ponderosa pine trees that were planted by the Forest post Forks Fire. The area used to be a timber stand and has not recovered from the fire. Image 1 and 2 in Figure 5 are post fire plantation that were thinned and released. This shows the long term effects that large scale moderate and high severity fires can have and that 20 years post fire and replanting. This stand still has not regained its larger trees. While it is desirable to have this difference in vegetation, large fires that burn at high severities across broad areas of a landscape take many years to recover.

Fire appears to have contributed in the past to large-scale disturbances within this watershed and is likely to have contributed to fragmentation and loss of forested habitats to an extent that would have affected northern spotted owls. (Upper Eel River Watershed Analysis)

FIRE ECOLOGY

Five primary fire ecological zones exist within the analysis area. Within each, fire has played an important role in the ecological processes.

Sierra Mixed Conifer stands (includes bps0310270) – In more recent history, fires in this type of stand have been less frequent, with fewer human-caused ignitions than were likely seen in the pre-settlement period. The majority of the fires post-settlement have been, and continue to be, rapidly extinguished by fire suppression resources. Fires that (in recent years) have burned under conditions severe enough to prevent rapid fire suppression have burned with greater severity than was likely seen during the pre-settlement era. This is largely due to overly dense understory and stand conditions as well as higher surface fuel loading. Recent fires like the Fouts (1987), Fork (1996), Trough (2001), Spanish (2003), Hunter (2006), North Pass (2012), and Mill (2012) have included broad areas of high severity burn; larger areas than were likely seen in the pre-settlement period. This is consistent with trends noted throughout northwestern California. A recently published study (Miller et al 2012) observed that while high severity burned area is staying at a constant percentage of total burned area throughout the area, total burned area is increasing. This means an increasing trend in the area burned at high severities. The study also noted that the percentage of severely burned area is holding steady at a rate higher than the historic norm. Current ignition sources include lightning, and human-caused fires (including prescribed fires, unintended wildfires and arson).

Chaparral (this type includes bps0311050, bps0310980, bps0310970) – Chaparral typically burns with high severity; making it difficult to characterize certain aspects of the fire regime. Published estimates of typical fire return intervals in chaparral range from 30-90 years (Van de Water and Safford, 2011). Researchers have noted a shorter fire return interval on this forest than others in the region and attributed this to its proximity to the Sacramento Valley (Skinner et al, 2009). This proximity likely resulted in more human-caused ignitions (historically). Given this history, it seems likely that chaparral on this forest was exposed to ignition more frequently and thus burned with a return interval closer to the low end of the described range (30 years, rather than 90 years). Empirical observations on the Mendocino National Forest over the last several decades of fire management suggest a direct correlation between fuel age and flammability. Even under extreme summer fire conditions, fires don't typically burn well through chaparral less than 10 years old. The 2012 Mill Fire was observed to stop at the fire scar of a chaparral field within the 2001 Trough Fire area. Chaparral stands from 10-30 years old have been observed to burn in fire season conditions, but managers are seldom successful igniting chaparral less than 20-30 years old under prescribed burning conditions. While at around 30 years of age and older, chaparral stands have typically filled in sufficiently and accumulated enough dead material to readily burn, even under mild conditions.

Oak Woodlands/Oak Conifer/Madrone Conifer –Black Oak-Conifer forest and woodland areas likely had historical fire frequencies in the 5-30 year range, with shorter intervals and lower severity in the upland vegetation and longer intervals and mixed severity in the more mesic portions (Landfire). Areas that were predominantly Oak Woodland during the pre-settlement era are now intermixed with overcrowding conifers. These areas would likely have been burned more often by the American Indians. The Upper Middle Eel Watershed Assessment (UMEWA) states that it is likely that the American Indians used fire for several purposes including fire management, maintenance of habitat diversity to promote healthy populations of game species and viable hunting lands, preferred Native American plant foods, and plant materials for basket-making. . Intensive burning probably only occurred in proximity to major settlements. Grass fires were set to protect oaks by reducing fuel ladders. Black oak stands were likely burned in the fall at least every one to several years to ensure a worm free crop (Fire Mgmt Plan, p23) It is likely that the extent of hardwood stands on the forest have been reduced from the period preceding 1850. Keter (1995) estimated that in the North Fork of the Eel River Basin, oak woodlands covered 36% of the area in 1865, while conifer forests covered only 11%. By 1985, that dominance pattern was reversed, with oak woodlands covering only 6% and conifers covering 47%. A similar change is thought to have occurred in the upper elevations and northern end of the forest. Conifer encroachment is decreasing hardwood productivity, species diversity, and habitat quality for a number of species (Fire Mgmt Plan, p24)This fuels report does not suggest that we want to burn for these purposes nor that we would want to return stand conditions to this reference condition for such purposes (i.e. favoring food sources or basketry material). It is, however, reasonable to relate that the high frequency of fires led to stand conditions that were more adapted to fires and were therefore more resilient to fires. (Upper Main Eel Watershed Analysis, p67-68)

Knobcone Pine – (Pinus attenuata Lemmon) is a species adapted to flourish with fire. Knobcone pine stands are well adapted to regeneration after high-severity burns, and often replace mixed conifer stands in areas subject to infrequent, high-intensity wildfires (Agee 1993). Knobcone pine seeds prefer exposed soil in which to germinate, and do not grow well in the shade of other trees. They grow rapidly during their early years, but generally do not live as long as other tree species in this area. Knobcone pine in this area tends to appear in one of three conditions (Howard 1992).

First, it appears as isolated trees within stands of chaparral brush (mainly pure chamise or chamise/ceanothus chaparral) or as a band just upslope from chaparral. In these areas individual trees or small clumps of trees will be present. Observations of similar brush stands on this forest suggest that their extent may be driven by the frequency of fires in the brush stand.

Second, it appears as one species in a mix of trees (such as douglas fire, black oak and ponderosa pines) in stands slightly higher up in elevation. Where stands have not seen high-intensity fire in more than 100 years, knobcone trees appear as isolated individuals within stands, or may only be present as dormant seeds in the soil.

Third, in areas that had a mix of tree species and experienced a fire that killed the majority of overstory trees, knobcone trees dominate the site, with few or no other species present. In this situation, knobcone trees grow rapidly and in densely-packed formation, making the growth of other tree species unlikely. These conditions can persist for 60-80 years. Beyond this time, dense stand conditions and tree physiology tend to cause knobcone trees to die (Howard 1992) making room in the stand for other species if a seed source is nearby.

Two things seem to make the difference between the second and third situations above: Fire intensity and fire frequency. Stands that start off with a mature overstory and experience a low-to-moderate intensity fire tend to keep too much overstory canopy cover for knobcone pines to dominate a site. Where there are pockets of higher-intensity fire within a generally low-intensity fire, knobcone seedlings grow vigorously, however, it typically takes them 10-12 years to first produce seed-bearing cones. The stand must avoid fire until such time to populate the seed bank and remain a viable competitor to other plant species.

Since knobcone pines are highly adapted to fire they tend to be one of the dominant species that flourishes (along with brush) after a wildfire, especially in stand-replacing fires. The results of this can be seen following many of the fires on the Forest. For example after the Forks Fire of 1996, vast areas of conifer that burned under high intensities returned as thick stands of mixed knobcone pine and brush species. In the event of another fire, theses very dense stands would likely experience high fire intensities resulting in stand replacement. Stand-replacing fire would cause knobcone and brush to be the primary re-growth vegetation and would set back the areas to very early successional stages instead of promoting the current trees towards mid successional and eventually late successional stands.

Plantations – characterized by even-aged (and often even-sized) stands of primarily ponderosa pine, although some douglas fir plantations also exist. A majority of these stands have not been managed or have been minimally managed over the last years and have become very dense. Brush growth becomes understory ladder fuels and/or mixed into the trees as vegetation of similar height as the trees. Depending on position in slope, elevation, soil type and other factors affecting growth and health of the stand plantation conditions vary. Many stands consist of a majority of the trees being in the <10” dbh range, while others have grown in to the 12-16” range. Many of these plantation stands have and would burn like brush in wildland fires due to a combination of even age characteristics, high densities, and high levels of ladder fuels and decadent brush. This means that the likelihood for mortality to a majority of the vegetation in plantations is very high. In the event of a stand-replacing fire, it is likely that brush would succeed as the predominant vegetation type rather than an otherwise mid to late successional conifer stand. Plantation stands are generally modeled using a brush fuel models because of similarities in height between individuals, their proximity to one another, and the continuity of fuels as fire spreads from crown to crown.

WEATHER

Climate of the area is considered Mediterranean, with generally hot, dry summers and cool, wet winters. Yearly precipitation averages from 33-45 inches per year, falling mainly from November through March. Higher elevations accumulate snow over the winter. The area often receives no precipitation between June to October, and temperatures during this time may exceed 100°F.

Fire season on the Mendocino National Forest typically begins in mid to late May as seasonal precipitation dramatically decreases.

The thunderstorm season in the area is typically June through September, with the majority of thunderstorms passing through during June. One of such storms ignited the Soda Complex in 2008, which burned 6,500 acres during a 6 week period during the early part of fire season (June). The Back Fire was a part of the Soda Complex. Lightning also started several fires in August of 2015 on the Upper Lake and Covelo Ranger Districts. Precipitation is usually light from these thunderstorms. The most active months of fire activity marked by high fire indices are July though late September. North winds often occur in September and October bringing gusty winds and low relative humidity to the area, further raising fire danger for short durations. Fire season usually ends by the first couple inches of rain in late October or early November.

For this analysis, the 97th percentile weather was judged to be a reasonable level at which to analyze fire risk for this area. 97th percentile weather means that 97% of the time the weather is moister and/or cooler and only 3% of time is the weather hotter and/or drier than the weather inputs used. (For each item listed, 97% of the daily observations taken from May to October in 1970-2007 were at or below the listed value.) Table 3 shows 97th percentile conditions for the Mendocino National Forest. Weather data for this analysis was taken from the High Glade and Soda Creek RAWS from 1970 to 2007. The data used was between May 1st and October 15th, the typical fire season for the area. Weather was averaged between the two RAWS because of the proximity of the Soda Creek RAWS to the project area and the elevation similarities of the High Glade RAWS. Wind speeds were taken from High Glade RAWS since it is more representative of the project area.

The majority of winds at the High Glade RAWS station come from one of two directions – primarily from the North, South or South East. Wind speeds are most frequently in the 18 mph range and the highest on record was 30 mph. Note that wind speeds recorded at the RAWS are the average wind speed over a 10 minute period, taken once per hour and are measured at the 20 foot wind speed level. The 20 foot wind speed is the standard open wind measurement used by RAWS stations and is the wind speed measured 20 feet above existing vegetation. In order to derive Mid Flame Wind speeds which are what directly affect the direction of movement of the flaming front and is important in fire spread calculations, a conversion factor is used. For example, in a partially sheltered timber stand an 18 mph wind speed measured at the 20 foot level would translate into approximately 7.2 mph mid flame wind speed (MFWS). MFWS are taken at the mid-height of the flames. For weather data used in modeling fire behavior in this report, see Table 3

Table 3 – 97th percentile weather for the Pine Mountain Project Area

97th percentile weather for the Pine Mtn Project Area

High Glade RAWS

Weather variable	97th % value
20' Winds	18mph
Temperature	89F
Relative Humidity	13%
1 hour fuel moisture	2.38
10 hour fuel moisture	3.00
100 hour fuel moisture	4.50
1000 hour fuel moisture	5.90
Herbaceous Fuel Moisture	5.99
Live Woody Fuel Moisture	70

Soda Creek RAWS

Weather variable	97th % value
20' Winds	14mph
Temperature	101F
Relative Humidity	10%
1 hour fuel moisture	1.93
10 hour fuel moisture	3.34
100 hour fuel moisture	7.46
1000 hour fuel moisture	9.11
Herbaceous Fuel Moisture	2.00
Live Woody Fuel Moisture	70

(Average of High Glade and Soda Creek RAWS)

Weather variable	97th %
20' Winds	18mph*
Temperature	95 F
Relative Humidity	11.5
1 hour fuel moisture	2.15
10 hour fuel moisture	3.17
100 hour fuel moisture	5.98
1000 hour fuel moisture	7.5
Herbaceous Fuel Moisture	3.99
Live Woody Fuel Moisture	70

(*18mph winds were used because it is more representative of the project area than an average of the two RAWS stations)

Table 4 – Back Fire Weather

(*Data taken for Fire start date through containment date.)

Back Fire Weather June 21-29, 2008

Soda Creek RAWS					
Date	MaxTemp	Min RH	Max Wind	Max Gust	10hr fuel
21-Jun	98	9	4	11	6
22-Jun	93	7	4	12	7
23-Jun	92	10	4	12	8
24-Jun	93	18	3	12	8
25-Jun	87	25	3	14	9
26-Jun	87	34	4	12	10
27-Jun	92	24	2	10	10
28-Jun	100	23	4	14	9
29-Jun	90	31	5	15	10

High Glade RAWS					
Date	MaxTemp	Min RH	Max Wind	MaxGust	10hr fuel
21-Jun	81	12	12	23	4
22-Jun	76	10	17	26	4
23-Jun	76	3	12	21	4
24-Jun	76	8	12	20	4
25-Jun	74	23	12	19	5
26-Jun	75	16	11	18	6
27-Jun	79	21	8	16	5
28-Jun	84	25	11	18	5
29-Jun	80	21	13	19	6

Average of Soda Creek RAWS and High Glade RAWS					
Date	MaxTemp	Min RH	Max Wind	MaxGust	10hr fuel
21-Jun	89.5	10.5	8	17	5
22-Jun	84.5	8.5	10.5	19	5.5
23-Jun	84	6.5	8	16.5	6
24-Jun	84.5	13	7.5	16	6
25-Jun	80.5	24	7.5	16.5	7
26-Jun	81	25	7.5	15	8
27-Jun	85.5	22.5	5	13	7.5
28-Jun	92	24	7.5	16	7
29-Jun	85	26	9	17	8

Comparison of the Back Fire weather to the 97th percentile weather: Maximum temperatures during the Back Fire averaged 5.5-14.5 degrees cooler than the 97th percentile weather. Minimum RH averaged 1.5% to 14.5% higher during the Back Fire than the 97th percentile weather except between June 21st -23rd when they averaged 1% to 5% lower. Back Fire winds averaged 7.5-13 mph less than the 97th percentile weather. 10 hour fuel moistures averaged 1.83 -4.83% less than the 97th percentile weather. Weather was taken from RAWS data archive.

1.6 EXISTING CONDITION

STAND CONDITIONS

Units 3-9, 12-19, 21-35 and 37-39 are characterized by a mosaic of different conditions broken up primarily by the following characteristics: 1) small patches of large diameter trees with little understory generally occurring as very small patches within denser stands (Figure 6) described in the following sections; 2) areas of large trees with a multi-story layer of at least three levels which act as a ladder fuel component/fire carrier (Figure 7); 3) Dense medium sized trees (Figure 8); 4) Burned forest areas (Back Fire). See figure 2 above and Back Fire discussion below. Within each treatment unit, there are usually the first three characteristics and the fourth characteristic occurring within the Back Fire area only.

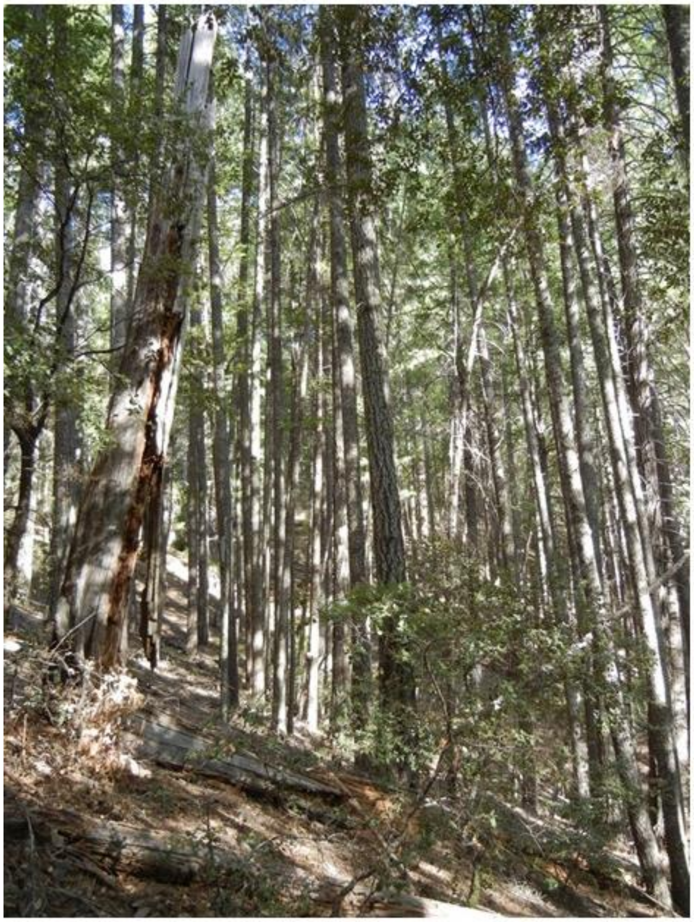
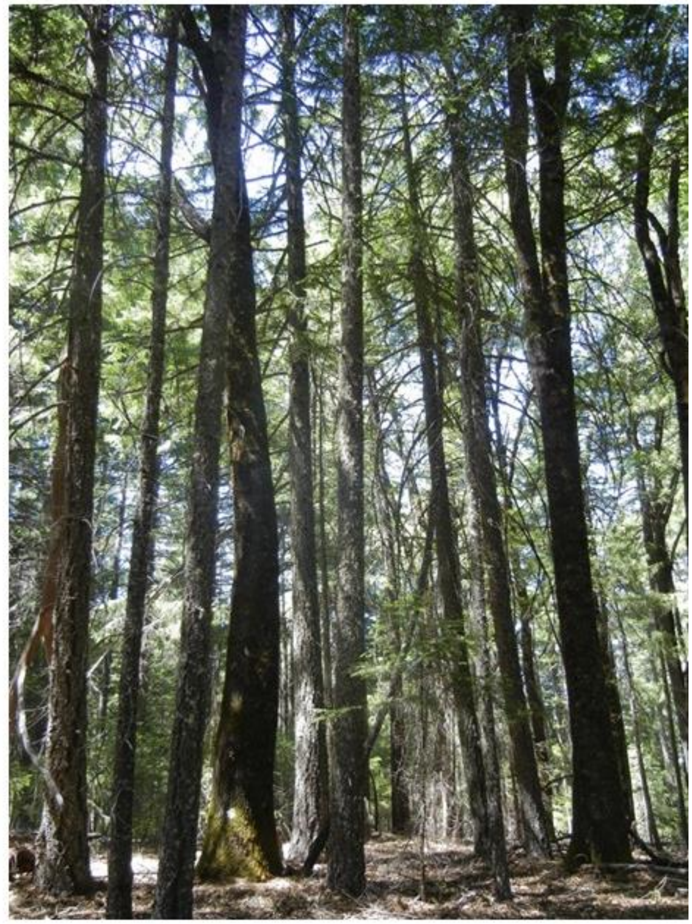
Figure 6

Small patches of open areas.

Figure 7

Ladder fuels.

Figure 8

Dense trees >10” DBH.

Figure 9

Back Fire >10" stand.

Figure 10

T13/14 has trees mostly >10" dbh. Since these trees are dense and self-thinning, this creates a heavy surface fuels component, making it difficult to burn without creating large amounts of mortality to the residual trees. During a fall burn, the logs would burn very hot and have a long residence time which is likely to create higher tree mortality. Conversely, a spring burn (if the unit does not fall under a smoke Limited Operating Period (LOP) for Northern Spotted Owls

(NSO)) would be unlikely to reduce surface fuels because the logs have a higher moisture content and would not burn.

Figure 11

Unit T-19 is comprised of a small area of open very large diameter trees mostly near the roadside on the north eastern portion. There are some patches of opening from previous treatments and the rest/majority of the unit is comprised of dense conifer trees with a very high crown bulk density. Also in the unit are ladder fuels and a major confluence of two drainages on a steep slope that would be a major fire path. Additionally, connectivity between thick TU5 vegetation downslope and west of the unit would increase the likelihood of a fire starting below T19 to initiate a crown fire.

Figure 12

Left: Large Douglas fire with surrounding fuels. Right: Large Douglas Fir snag. This snag was killed by the Back Fire. Stand conditions surrounding the snag were similar to those around the tree in photo on the left. Both trees and stands are situated on a ridge.

Figure 13

Units 40-90 ***are comprised of plantations, naturally forested areas, fuel breaks, areas burned in the Back Fire and chaparall:***

Naturally forested units and the fuelbreak are overstocked with Ponderosa Pine, Douglas fir and hardwoods, at approximately 400-1500 trees per acre under 10” DBH and approximately 40-225 trees per acre over 10” DBH. These areas are predominantly trees in the <10” dbh size class. However, it is not uncommon to find remnant larger trees (trees >18” dbh) in these stands as well. The crowns of the trees are close enough together and touching in most cases to support torching and/or crown fires. In addition to live ladder fuels, the dense canopy has caused elevated mortality of small diameter trees and brush in the understory, resulting in an unnatural level of dead ladder fuels and high surface fuel loading. The dead component of fuels in the understory adds to the fire hazard. In some areas, the initial use of prescribed fire is adequate to meet treatment goals. In other areas, pre-treatment utilizing hand and/or mechanical thinning and pile burning prior to an understory burn may be necessary. Where understory burning is utilized, multiple entries of fire may be necessary.

Units within the Backfire: The Back Fire created a mosaic of burn effects across approximately 1500 acres. Patches of mortality occurred initially but trees have continued to die in the following years of the fire. Elevated levels of larger (3"+ diameter) material have the potential to increase fire hazard in the area. This greatly increases the difficulty of fire suppression and likely impacts if a fire occurs. The greatest potential concern related to fuels management in this area is the potential for numerous trees killed by the Back Fire to contribute to undesired impacts and difficulties for fire suppression in future wildfires. These potential impacts are related to large build-up of logs causing fires to be more intense (putting off more heat at any given time) or have higher residence times (burn in one place for a longer time). Higher fire intensities and residence times have greater impacts on surrounding vegetation and the soil near logs. Within the first year, smaller diameter trees started falling to the forest floor. Over time, the size class of dead trees falling to the forest floor increases based on decay classes of different sized trees and different species of trees. In these areas, surface fuel loading is moderate to high. It is expected that understory burns in these areas of high surface fuel loads will burn at a moderate intensity with patches of high intensity, while in other areas low intensity fire is expected. Where fuel loads are higher, the primary purpose of prescribed burning is to reduce surface fuel loading. In areas where fuel loading is lower, the primary purpose for prescribed fire is to restore the historic fire regime. There are several units within the Back Fire perimeter where thinning is proposed and several units where burning only is proposed.

Plantation (Figure 4) characteristics are discussed under the Fire Ecology section earlier in this report. They are usually even-aged and sized with little diversity. When a wildfire burns through these stands, they typically experience stand-replacement and set the area back to one stage again, keeping the trend and not developing the diversity nor larger trees.

Figure 14

Chaparral: Several large areas of chaparral exist within the Pine Mountain project. Most of these consist of decadent woody material. The last recorded large fire was in 1932 in the extensive chaparral field on the Western end of the project. Within these areas there are stands of oak and conifer vegetation types as well interior live oak/chaparral mix. Chaparral also exists within forested stands as small patches or individual brush of varying age classes and species.

FUEL MODEL AND LOADING

For this report the Standard Fire Behavior Fuel Models by Scott and Burgan: A Comprehensive Set for Use with Rothermel's Surface Fire Spread Model were utilized. Since the LSRA refers to the original set of fuel models by Anderson, a crosswalk of these fuel models to the original fuel models is provided in Table 5 below.

Table 5 – Fuel Model Crosswalk

Grass fuel type

Consider using one of these fuel models from the new set...	... if you used one of these models from the original set.		
	1 Short Grass	2 Timber Grass and Understory	3 Tall Grass
GR1	For very sparse or heavily grazed grass; for lower spread rate and flame length		
GR2	For slightly lower spread rate and comparable flame length	For comparable spread rate and slightly lower flame length	
GR3			For lower spread rate and slightly lower flame length
GR4	For slightly lower spread rate and much higher flame length	For higher spread rate and slightly higher flame length	
GR5			For lower spread rate and slightly lower flame length
GR6			For slightly lower spread rate and comparable flame length
GR7	For comparable spread rate and significantly higher flame length	For much higher spread rate and flame length	For comparable spread rate and slightly higher flame length
GR8			For comparable spread rate and higher flame length
GR9			For higher spread rate and much higher flame length
GS1		For slightly lower spread rate and lower flame length	
GS2		For slightly lower spread rate and flame length	

Shrub fuel type

Consider using one of these fuel models from the new set...	... if you used one of these models from the original set.			
	4 Chaparral	5 Brush	6 Dormant Brush	7 Southern Rough
SH1		For lower spread rate and flame length	For lower spread rate and flame length	
SH2		For lower spread rate and slightly lower flame length	For lower spread rate and flame length	
SH3				For lower spread rate and flame length
SH4			For slightly lower spread rate and comparable flame length	For comparable spread rate and flame length
SH5	For slightly lower spread rate and flame length	For much higher spread rate and flame length		
SH6			For slightly lower spreadrate and higher flame length	For slightly lower spread rate and higher flame length
SH7	For slightly lower spread rate and flame length	For slightly higher spread rate and much higher flame length		
SH8				For slightly lower spread rate and higher flame length
SH9				For slightly higher spread rate and much higher flame length
TU5		For lower spread rate and slightly higher flame length		
GS2		For comparable spread rate and slightly lower flame length; with grass component		

Fuel models range across the project area with approximately 60% of the area represented by TU5. TU5 has a heavy forest litter and shrub or small tree understory component, which drives fire behavior. Another approximately 23% of the area is represented by TL8 and 9% by TL7. The remaining areas are comprised of small areas of other TL and TU understory fuel models as well as shrub and grass fuel models.

Fuel loading is a primary factor of fire behavior and ecosystem effects. Fuels position, arrangement, continuity, compaction, moisture, type, crown base height, canopy cover, crown height and crown bulk density are examples of fuels variables used to evaluate the degree of departure from historic conditions or to provide estimates on potential fire behavior.

Current surface fuel load accumulation in the area ranges from approximately 4-75 tons/acre of dead woody material on the ground. Low amounts of surface fuel generally occur in young pine plantations, brush fields, oak stands, and areas that have been more recently burned (wildland fires or prescribed fires). While surface fuel loading is not excessive in some areas of the project, most areas have accumulated fuel far in excess of levels that would be seen in a fire resilient ecosystem. Even where surface fuel loads are not excessive, other factors, such as ladder fuels and high canopy bulk densities, put the stands at higher risks of damage from a wildland fire. Some small areas are in current conditions that can allow the use of fire without pre-burn thinning treatments. However, these patches of areas not requiring pre-treatment are interspersed among large areas needing treatment, therefore a wide range of tools are necessary to meet the treatment needs of the area. Fuel loadings were determined by using browns transects as well as the photo series method. This is the receptive fuel bed and primary carrier of surface fire. The fuel loading is also directly related to the surface fire spread and flame lengths.

FIRE REGIME AND CONDITION CLASS

Fire regimes describe the historical ecological role of fire in creating and maintaining vegetation communities before Euro-American settlement activities and active fire suppression began. Fire regimes on the MNF have and continue to determine the Forest's vegetation and fuels conditions. The forest includes both fire-maintained ecosystems, in which frequent low intensity surface fires maintain vegetative conditions (i.e. ponderosa pine) as Fire Regime 1; and fire initiated ecosystems in which stand replacing events initiate new vegetation cycles (i.e. fir or chaparral) as Fire Regime 2. (Fire Mgmt Plan, 23)

Fire on more mesic sites occurred most often in the late summer or fall months (August-October) and this is similar to recorded observations elsewhere in the region (Taylor and Skinner 1998, Taylor and Skinner 2003). On drier sites however, a significant portion (85%) of fires before 1850 occurred from spring to mid-summer (Skinner et al 2009). Fire intensity was generally low, killing pockets that burned at higher intensities due to variation in fuels and burning conditions across the landscape. However, there is evidence of naturally occurring higher severity fires even in these historical fire regimes, but at a less frequent interval. Fire regimes of this type have also been estimated to experience much more severe fires once every few centuries (200-1,000 years) when climate conditions line up (un)favorably Kilgore 1981, Barrett et al 2010). Ignition sources historically included lightning, and human-caused fires started by native peoples (Skinner et al 2009, Keter 1995, Brown 2000, Keeley 2002). During the last half of the 20th century, aggressive fire suppression and climate changes have resulted in increased forest density, fuel accumulation and interval between fires (Stuart and Salazar 2000;and (Calkin et al. 2005).

The classification used to describe how current conditions differ from historic conditions for an area is called condition class (Hann and Others 2004). Condition class is rated on a scale of 1-3. Condition class 1 indicates an area where conditions are similar to reference conditions and there is generally low risk of the loss of ecosystem components. Condition class 2 represents a more significant departure from reference conditions and correspondingly greater chance of loss. Condition class 3 indicates severe departure from historic conditions and significant chance for the loss of species, habitat, private property, etc. Condition class for an area is based on two measures: the comparison between historic and current species composition, and the frequency of disturbance compared to historic frequencies. As fuels conditions move away from historic conditions, the risk of losing ecosystem components and biological diversity (specific species, habitat for wildlife, aquatic ecosystem health and functions) as well as the risk to life (firefighter and public) and private property also increase. Approximately 80% of the project area is in a condition class III. Approximately 20% of the project area is in a condition class II (Landfire). See Figure 2 for Condition Class map.

MFRI- MEAN FIRE RETURN INTERVAL

Although most of the project area is likely to have experienced fire prior to the fire suppression era, recent fire history records show that there has been very little fire within the project area and that the fire return intervals have deviated from what was likely the (pre suppression) historic fire frequency. This is especially true within the project area where suppression efforts have been successful. Due to the lack of fire, brush and trees have encroached on meadows, trees are overcrowded and suppressed, ladder fuels pose higher torching and crowning risks, and excessive surface fuels exist that will likely burn with much higher intensity. These factors all combine to create conditions conducive to a high intensity wildfire that threatens the LSR habitat. This LSR is at risk of losing habitat to these high intensity fires.

Mean fire return interval (MFRI) for the project area is the average time it takes for a fire to burn an area equal to the size of the project area. For example, the MFRI of a 1000 acre project is the number of years (on average) for the burned area in the project to add up to 1000 acres. This does not mean that every acre within the project area will burn in that time; some areas may burn twice or more, while others may not burn at all.

Current MFRI: Based on the analysis completed for the project, current MFRI for the project area is around 254 years for the project area. See Table 2. The best estimate of the MFRI for the project area prior to 1910 is approximately 7-17 years (LANDFIRE, 2006). Current MFRI's are approximately 19-46 times the historic value.

Table 6 - Project Area Current MFRI

In Project Area	
Year	Acres Burned
1932	1459
1966	182
1986	79
1998	42
2008	1318
100 year total	3080.0
Total Project Unit Acres Approximately	7830.0
Actual average acres burned/year	30.8
Current MFRI for Project Area	254

In addition to the MFRI data from LandFire, the following studies all support the idea that the project area historically experienced, in general, a more frequent fire return interval with lower fire intensities. Landscapes that supported fire regimes of higher fire frequencies and lower fire intensities, such as those that occurred under historical regimes, were much more fire resilient. And while higher severity patches occurred, even in these types of fire regimes, these patches supported the need for habitat diversity while significantly reducing the risk of losing a majority of the LSR habitat. Because the Forest has little left of this type of habitat, enhancing and protecting these areas is important.

While, the ranges do not all overlap, the following studies all indicate much shorter fire return intervals than current. A study done by Skinner, which included several plots on the Forest, indicate that mixed conifer forests like the ones in the project area developed with fires of generally low intensities occurring very frequently, with a median fire return interval of about 5.5-8 years for sites studied for all fire scars and 10-12 years for >2 scars per study site (Skinner and Others 2009). These studies found fire occurrence on the Mendocino to be higher than reported on other forests in the area such as the Klamath N.F. (Wills and Stuart 1994), the Six Rivers N.F. (Stuart and Salazar 2000) and the Lassen N.F. (Beaty and Taylor 2001).

A small study within the Middle Fork Eel watershed looked at stump scars which indicated that, on average, a fire intense enough to scar trees occurred every 30 years. Additional small studies conducted in the Sugarfoot Fire area showed a fire return interval between 10 and 21 years for low elevation ponderosa pine dominated forest. The study by Rubiaco included trees from the Upper Main Eel Watershed. Slab analysis is limited to detecting fires that were intense enough to lave scars on trees. It is probable that many low intensity fires occurred that did not leave scars. The Upper Main Eel Watershed Assessment concludes that it is reasonable to state that the average interval between scarring fires prior to effective fire suppression would be between 10-25 years for most of the lower elevation forest ecosystems of the Upper Main Eel watershed. (Upper Main Eel Watershed Assessment)

INDICATOR #1 FIRE ACTIVITY TYPE

Fire activity types were calculated in the following three categories: Surface Fire, Torching and Crowning. Both crown fires and torching of trees results in a majority loss of trees to mortality. Under existing conditions, and with the no action alternative, 51% of the treatment areas would experience crown fire activity, 24% would experience torching, and 25% would experience surface fires. Therefore high mortality is expected in approximately 75% of the proposed treatment areas. Canopy fires are also much more difficult to suppress and pose greater danger to suppression resources. Furthermore, the impact of fire suppression strategies on the natural environment are generally more severe under these circumstances. For example suppression tactics utilizing dozers and aircraft retardant usually have more severe effects to the environment.

The LSRA describes undesirable effects as tree mortality over 25% (LSRA p41). Under current conditions, tree mortality is expected in 75% of the stands which is far in excess of desired levels.

Table 7 - Crown Fire Activity (CFA) Type Current Conditions All Units

Alternative 1/Current Conditions - FIRE TYPE (CFA- Crown Fire Activity)							
	Commercial (Treatment 3)	Fuels (Treatment 2 & 4)	Plantations (Treatment 1)	Backfire (Treatment 6)	Chaparall (Treatment 5)	Average All Treatments	Avg All Treatment w/o chaparall
Surface	18%	27%	35%	19%	24%	25%	25%
Torching	49%	43%	43%	69%	32%	47%	51%
Crown	33%	30%	22%	12%	44%	28%	24%

INDICATOR #2 FLAME LENGTHS-FIRELINE INTENSITY

Fireline intensity is used as a means to relate visible fire characteristics and interpret general suppression strategies. One visual indicator of fireline intensity is flame length (Rothermel 1983). In general, when flame lengths are less than 4 feet, direct attack at the head and flanks is possible and suppression strategies such as handlines and hoselays should stop spread of fire. When flame lengths are greater than 4 feet, fires are too intense for direct attack strategies. Table 9 compares fireline intensity, flame length and potential suppression difficulty in more detail. Under existing conditions, approximately 77% of the proposed project area would experience flame lengths greater than 4 feet. This means that given a fire started somewhere in that area, direct suppression would not be feasible and the chance that the fire will escape initial attack is high.

Table 8 - Table 7 – Flame Lengths Interpretation (Table based on Rothermel 1983)

Fireline Intensity	Flame Length	Interpretations
Low	< 4 feet	Direct attack at the head and flanks with hand crews; handlines should stop spread of fire
Moderate	4-8 feet	Fires are too intense for direct attack on the head by persons using handtools. Handline cannot be relied on to stop fire spread. Equipment such as dozers, engines, and retardant aircraft can be effective.
High	8-11 feet	Fires may present serious control problems-torching, crowning, and spotting. Control efforts at the fire head likely ineffective. This fire would require indirect attack methods
Very High	>11 feet	Crowning, spotting, and major fire runs are probable; control efforts at the head are likely ineffective. This fire would require indirect attack methods

Table 9 – Flame Lengths No Action All Units

Alternative 1 /Current Conditions - Flame Lengths							
	Commercial (Treatment 3)	Fuels (Treatment 2 & 4)	Plantations (Treatment 1)	Backfire (Treatment 6)	Chaparall (Treatment 5)	Average All Treatments	Avg All Treatment w/o chaparall
0-4	22%	21%	22%	21%	24%	22%	22%
4-8	1%	3%	5%	2%	0%	2%	3%
8-11	0%	1%	1%	1%	0%	1%	1%
11+	76%	75%	72%	75%	76%	75%	75%

1.7 ENVIRONMENTAL CONSEQUENCES

Tables 10 and 11 compare the no action alternative (alternative 1) with the proposed action alternative 2. Tables 12 and 13 compare alternatives 1 through 5. Alternatives 3,4 and 5 occur only within the commercial units, therefore data in tables 12 and 13 are fire behavior modeled for within treatment 3 (commercial units) only.

Table 10 – Overall Project Comparing Fire Activity Types (CFA)

Alternative 1/Current Conditions - FIRE TYPE (CFA- Crown Fire Activity)							
	Commercial (Treatment 3)	Fuels (Treatment 2 & 4)	Plantations (Treatment 1)	Backfire (Treatment 6)	Chaparall (Treatment 5)	Average All Treatments	Avg All Treatment w/o chaparall
Surface	18%	27%	35%	19%	24%	25%	25%
Torching	49%	43%	43%	69%	32%	47%	51%
Crown	33%	30%	22%	12%	44%	28%	24%

Alternative 2/Proposed Action - FIRE TYPE (CFA- Crown Fire Activity)							
	Commercial (Treatment 3)	Fuels (Treatment 2 & 4)	Plantations (Treatment 1)	Backfire (Treatment 6)	Chaparall (Treatment 5)	Average All Treatments	Avg All Treatment w/o chaparall
Surface	92%	84%	76%	77%	59%	78%	82%
Torching	3%	8%	12%	21%	16%	12%	11%
Crown	5%	7%	12%	2%	25%	10%	7%

Table 11 – Overall Project Comparing Flame Lengths

Alternative 1 /Current Conditions - Flame Lengths							
	Commercial (Treatment 3)	Fuels (Treatment 2 & 4)	Plantations (Treatment 1)	Backfire (Treatment 6)	Chaparall (Treatment 5)	Average All Treatments	Avg All Treatment w/o chaparall
0-4	22%	21%	22%	21%	24%	22%	22%
4-8	1%	3%	5%	2%	0%	2%	3%
8-11	0%	1%	1%	1%	0%	1%	1%
11+	76%	75%	72%	75%	76%	75%	75%

Alternative 2/Proposed Action - Flame Lengths							
	Commercial (Treatment 3)	Fuels (Treatment 2 & 4)	Plantations (Treatment 1)	Backfire (Treatment 6)	Chaparall (Treatment 5)	Average All Treatments	Avg All Treatment w/o chaparall
0-4	92%	83%	70%	74%	60%	76%	80%
4-8	1%	4%	6%	1%	0%	2%	3%
8-11	0%	0%	1%	0%	1%	0%	0%
11+	7%	12%	23%	24%	39%	21%	17%

Table 12 – Commercial Unit Alternatives Comparison for Fire Activity Type

Flame Length	Fireline Intensity Hazard Rating	Percent of Area No Action Alternative 1	Percent of Area Alternative 2 & 3	Percent of Area Alternative 4	Percent of Area Alternative 5
less than 4	Low	22	92	79	91
4-8	Moderate	1	1	3	1
8-11	High	1	0	1	0
11+	Very High	77	7	17	8
Total		100	100	100	100

Other treatments in the area that have been previously decided upon would be implemented.

Table 13 – Commercial Units Alternatives Comparison of Flame Lengths

Potential Crown Fire Class	Percent of Area No Action Alternative 1	Percent of Area Alternative 2 & 3	Percent of Area Alternative 4	Percent of Area Alternative 5
Surface Fire	18	92	73	89
Crown Fire	49	4	8	6
Torching	33	5	19	5
Total	100	101	100	100

1.7.1 ALTERNATIVE 1: NO ACTION ALTERNATIVE

Direct Effects:

Under this alternative, no treatments in the proposed area would take place. Observed trends in fuel accumulation and vegetative structure would likely continue. As discussed above in "Existing Conditions", stands in the project area are already more dense than they were historically and surface fuels are more excessive than is natural for the area if it had its historical fire frequencies. As shown in Tables 10 and 11, many of the stands are already at high risk for moderate to high severity fires if they are not treated. Such fires have adverse effects on ecosystem components, put the LSR at risk for habitat loss in the majority of the Pine Mountain project area, and pose a threat to life and property. Figures 13 and 14 show examples of some of the potential effects. Suppression activities would also likely go beyond initial attack and negatively impact the landscape.

The Back Fire area would continue its natural process as snags continue to fall and accumulate as surface fuels. Brush and knobcone will continue to grow into areas that burned at higher severity. Snags currently standing in the Back Fire would fall over time, with the majority of snags falling in the next 10 years and fall rates declining over time until the last snags produced by this fire likely falling in approximately 40 years. Fallen snags will continue to accumulate as surface fuel on the ground causing excessive fuel loads and increasing likelihood of future large wildfires because of the increases in the difficulty of fire suppression and the likely impacts if a fire occurs. The greatest potential concern related to fuels management in this area is the potential for numerous trees killed by the Back Fire to contribute to undesired impacts and difficulties for fire suppression in future wildfires. These potential impacts are related to large build-up of logs causing fires to be more intense (putting off more heat at any given time) or have higher residence times (burn in one place for a longer time). Higher fire intensities and residence times have greater impacts on surrounding vegetation and the soil near logs. For example, trees (including those larger trees) that have these fuel buildups near them are at much higher risk of mortality.

Indirect Effects:

Without treatment and in the absence of a wildfire, it is expected that stands would continue to get denser, ladder fuels would increase, and surface fuel loading would further accumulate. In the event of a wildfire, denser understory conditions can result in a greater risk for wildland fire to burn the entire canopy of stands, to have severe and detrimental effects on water quality and species habitats, and pose a serious threat to life and property as well (See Fisheries/Aquatics Report, Hydrology Report). Table 7 outlines the amount of the treatment area which already may experience fires intense enough to remove some or the entire canopy.

Back Fire: Elevated levels of large (3"+ diameter) material have the potential to increase fire hazard in the area. While it does not change the probability of a fire, in areas of high fuel concentrations, it does greatly increase the difficulty of fire suppression and likely impacts if a fire occurs.

The no-action alternative does not have any direct effect on air quality. This alternative does have the potential for a significant indirect effect if a wildfire were to occur in the project area.

Cumulative Effects:

1.7.2 ALTERNATIVE 2: PROPOSED ACTION

Under this alternative, a combination of prescribed fire and thinning will be utulized. The following thinning techniques will be used as appropriate on the landscape to meet objectives: Hand thinning and mechanical thinning; hand and mechanical piling, and chipping. Burning would include pile burning, jackpot burning and understory broadcast burning. Spring and Fall burning would allow for meeting LRMP guideline for varying prescribed fire intensity, seasonal timing, retention of large woody material of burns and reducing smoke impacts. Having the flexibility to burn during different seasons allows for managers to meet objectives of prescribed burns. Details of treatment by type and acreage can be found in the Pine Mountain EIS.

Direct Effects:

The effects of the treatments on modeled fire behavior on the fire type and flame lengths expected are shown in Tables 10, 11, 12 and 13. Alternative 2 has the greatest reduction in areas expected to have canopy fires (torching and crowning) and has the greatest effect on reducing flame lengths to less than 4 feet. In addition to reducing fire behavior as described above, moving MFRI's towards a more historical level would increase the LSR's resiliency to wildfire events. While treatment may not return MFRI to its historical conditions, moving it closer to fire return intervals of historical values will help improve fire resiliency in the stands. Since stand conditions at the historical return intervals were more fire resilient, it is expected that the Pine Mountain LSR will be more resilient after the proposed action is implemented. Further detailed and discussed below are the main treatment types and their direct effects.

Commercial Thinning:

Removal of larger trees in the stands would have several direct effects on potential fire behavior within the stand. It would reduce the amount of canopy fuels available to burn, and would lessen the risk of a crown fire. The thinning or opening up of crowns reduces crown bulk density, thus reducing the chance of a fire being carried through the crowns of trees and causing mortality. Tree selection favoring retention of large trees and removal of small trees raise the average canopy base height of the stand. This reduces the risk of fires moving from the ground into the canopy as torching and/or crown fires.

Following completion of all proposed treatment activities within each unit (this includes any post commercial thinning of trees <10" and prescribed burning operations), it is expected that fuel hazards will be reduced to levels far below current conditions. Analysis of the commercial units show that before treatment approximately 18% of the area would experience surface fires and approximately 82% of the area would experience torching and/or crown fires (canopy fires). After treatment, it is expected that approximately 92% of the commercial treatment areas would experience surface fires and 8% would experience canopy fires. 8% mortality meets the LSRA's guidance by being less than 25% mortality threshold. Analysis also shows that prior to treatment the average flame lengths in 78% of commercial units were over 4 feet. Post treatment only 8% of the commercial units would exhibit flame lengths over 4 feet. Refer to Figures 14 and 15 for maps of post treatment fire activity types as described above. Opening the canopy in stands may increase the amount of sunlight reaching fuels on the ground and decrease the amount of wind sheltering provided by the trees. This sometimes may lead to a higher rate of spread however, because surface fuel loadings will have been reduced, fire intensity will be less making the effects of fires burning through the stands more beneficial than damaging.

Harvest operations can be expected to add to the amount of surface fuels in the treated stands even with the harvest methods that remove a majority of slash from the unit. These changes have the potential to increase fire behavior within the stand. However, the proposed action calls for burning of surface fuels after tree removal. These treatments of surface fuels is expected to counteract any increase in potential fire behavior resulting from changed stand structure, leading to a net reduction of potential fire intensity within treated stands. During the time between tree removal and surface fuel treatments (generally 1-3 years) there may be an increase in the intensity of potential fires within the stand.

Studies of some areas conclude that fire intensities were greater in stands that were exposed to wildfire before surface fuels were treated (Graham et al, 1999, Finney et al 2003). Other studies have found that intensities in such stands were comparable to that of untreated stands (Murphey et al, 2007). A report from the Angora Fire showed commercial thin units (with follow up pile burning) to be very effective at moving crown fire to surface fire (Murphey et al, 2007). Similarly, a report from the Moonlight Fire showed commercial harvest units to have reduced canopy loss as compared to untreated units (but not as much as thinning/burning) (Dailey et al, 2008). A report on the

American River Complex showed that treated areas not prescribe burned did reduce fire behavior but were still intense enough to kill many overstory trees. However, units that were treated with prescribed burning following treatment reduced the effects of fire behavior even further. A report on the effectiveness of treatments affected by the Cone Fire showed that thinning of stands greatly reduced mortality of trees subjected to the fire, and stands that were thinned and followed by prescribed fire showed even greater reduction in mortality.

Thinning of trees less than and equal to 10" dbh in plantations and naturally forested areas:

Direct effects on fire behavior and fuel condition for these treatments are expected to be similar in many regards to those of commercial thinning. Removal of small trees (<10" DBH) and brush from the understory of a stand raises the average canopy base height of the stand and lessens the chance that a fire will scorch or burn the canopy of the stand. In some stands within the project area, the removal of some of the trees in the stand will increase the amount of light and wind reaching the ground. In these stands, the treatment of surface fuels within the stand and reduction in the number of small trees in the stand are expected to result in less intense fires (as discussed above under commercial thinning).

In Nesting units, it is desirable to keep a certain amount of stand structure without compromising the fire resiliency of that stand. Since northern spotted owls are likely to utilize smaller understory trees and because scientific evidence suggests that the layering of trees creates air temperatures that conform to the needs of these owls, it important to leave some of these structures where they can be maintained while still protecting the stand from negative effects of a wildland fire. Understory thinning in these stands would be implemented so that ladder fuels will be reduced where needed to prevent torching and crowning of large overstory trees. However, where there is little risk of crowning or torching, the structure may be left.

Mechanical fuels treatment: Direct effects on fire behavior and fuel conditions are expected to be similar in many regards to those described for thinning operations. Since these treatments are proposed in areas of dense understory vegetation, where thinning by other methods would be difficult, they are expected to significantly reduce the potential for intense fires within these stands. As with other thinning activities, the full effects of the treatments for reducing undesirable risks from wildfire will not be achieved until all treatments are complete, including prescribed burning.

Prescribed burning:

This treatment is expected to have several direct effects on treated stands. Burning is expected to reduce the amount of small diameter surface fuel present in treated stands. Burning is expected to kill some portions of understory vegetation within timbered stands and also reduce brush regrowth. Both of these effects will reduce the potential intensity of any wildfires that burn through the area within the next 10-15 years (Keifer et al 2006). The actual amount of surface fuel or understory vegetation consumed by burning is highly dependent on the conditions at the time of burning. Burning is also expected to kill some larger trees within timbered stands. Mortality is expected to vary with stand structure and conditions at the time of burning, but is expected to be less than 10% in trees over 16” DBH (which meets the guidelines of the LSRA). Burning is expected to remove some existing snags and logs from the treated stands. It will also create new snags and logs through overstory mortality (Stephens and Moghaddas, 2005) (Bagne and Others 2008). While some large woody debris is likely to be consumed, at least a minimum of required levels per Best Management Practices will be maintained and some new large woody debris created with mortality from burning. Burning is also expected to raise the average canopy base height of treated stands, not only through the removal of smaller trees in the understory, but also through the heat-pruning of lower branches on surviving overstory trees. Brush burning would have several direct effects including: 1) reducing wildland fire hazards and 2) moving towards returning diversity in brush seral stages. Diversity in seral stages is beneficial to the wildlife that are dependent on the brush for habitat and food sources. While prescribed burning can be used as a tool to thin small diameter (generally less than 6” dbh) trees, it takes several entries of fire to successfully thin a stand. The initial burn would kill some of the small diameter trees but those would be left standing dead, which acts as dead ladder fuels. At least one additional entry of prescribed fire is needed to consume these fuels. Prescribed burning without hand or mechanical thinning first (especially in multi-story, dense areas) is more likely to carry fire into the canopies of the mid-sized and larger trees that are overstory, resulting in higher risk of mortality to the overstory trees than mechanical or hand thinning of these trees.

Due to heavy fuel loading, prescribed burning may require multiple entries in order to meet objectives. Prescribed burning would likely kill some of the understory trees, but not all. Therefore, stand structure would remain following a low to moderate intensity understory burn.

Prescribed burning is often effective in reducing surface fuel loadings to desirable levels as well as to reduce potential brush regrowth in timbered stands following initial treatments. Some brush regrowth in the timbered stands is expected, even desired as habitat and would not pose high risks of fire activity. The amount of brush and forb regrowth that may be expected would pose less of a fire risk than the no-action alternative and would allow natural ignitions to burn through the stand with less torching/crowning and mortality than under the no-action alternative. Even with higher fire return intervals under historical fire regimes, it would have been natural to have some patches of brush and forb growing in timbered stands.

Prescribed fire will maintain nesting and foraging habitat for northern spotted owl by using the following consideration and techniques that are utilized during the burn plan writing and burn implementation stages. The burn prescriptions will be developed taking into consideration the following conditions that affect fire behavior: relative humidity (rh), wind speed, temperature, fuel moisture levels (1, 10 and 100 hours), seasonal conditions (i.e. drought year), aspect, slope, and vegetation type. Special consideration shall be taken in nesting habitat in order to maintain the required canopy cover, protect potential nesting trees, take into consideration vertical and horizontal continuity for northern spotted owls, and limit smoke impacts. In order to meet all these criteria, having a Spring and Fall burn window is critical.

Indirect Effects:

For all units, treatments are expected to have a beneficial effect on immediately adjacent, un-treated stands for a short distance. In case studies of the effectiveness of fuel treatments exposed to wildfires, treated units modified the behavior of fires for up to 300' beyond the unit (Murphy and Others, 2007). In a number of proposed units, treatments would decrease the number of trees present in the stand, decreasing competition for light and water. Fires are expected to move more slowly and with less intensity through treated units. Studies have shown that a number of treatment units strategically placed within a landscape can slow the growth of large fires (Finney 2001, Finney 2006). While fires are a natural and necessary part of the ecology of this area, current conditions create the potential for fires of greater intensity and size than are normal for the area (as outlined previously in this report) and the ability to suppress or mitigate such fires will be an important part of restoring this area to more ecologically resilient conditions.

Treatments, as proposed, are expected to have the indirect effect of lowering the potential emissions of a summer wildfire (after implementation of treatments) in the project area. This indirect effect is the result of removing some of the fuel in the project area and of making some of the fuel remaining in the stand unavailable to burn. Fuel is removed by removing commercial timber, pre-commercial and understory trees less than 10 inches DBH, and by burning off some of the surface fuel in a prescribed fire. Some of the remaining fuel is made unavailable to burn by reducing the chance of tree crowns burning under all but the most extreme conditions.

Cumulative Effects:

Several projects have been completed within 2 miles of the project area within the past 20 years or are ongoing and within 2 miles of the project area. There are several other fuels projects that are ongoing to the north and south of the project. Thinning around Pine Mountain Lookout and the Elk Mountain Fuel Break thinning projects are within the project area The Howard Mill understory burn project is approximately 7000 acres of burning within the Round Fire plantations. It is adjacent to the project area with several units falling within the project area. The Willow Creek thinning project is primarily a pre-commercial thinning and fuels reduction thinning within the Round Fire Plantations. The Horse Mountain Thinning project was a commercial thinning project to the South West of Pine Mountain. The Streeter Ridge thinning project was a pre-commercial thinning project that lies between Pine Mountain project and Horse Mountain project. The Westshore fuels reduction project is just north of the Pine Mountain project.

Treated units in this project are expected to have an effect on the growth of large fires in the project area that is cumulative with previous and on-going treatment units within as well as adjacent to the project area (projects are listed above). All of these projects combined can be expected to have a cumulative reduction on the potential size of fires that are large enough to contact more than one treatment (Finney 2001).

Because of the widespread, but short-lived, impacts of emissions from fire, no other projects were considered for this cumulative smoke/emissions impact analysis. Emitted pollutants from fire do have an effect on an area, the size of which depends on atmospheric conditions at the time of the fire. Within this area, pollutants from fires can be cumulative with emissions from many sources, including other fires, vehicles, industrial sources, buildings and agriculture. It is impossible to predict what pollution sources may be present at the time of a fire occurring at some unspecified date in the future. For smoke emissions analysis see the Air Quality Report attached as Appendix A.

Road brushing – This activity is routinely carried out by fire crews as part of road maintenance. This is not expected to cause cumulative effects within the project since it is carried out within 5 feet of roadsides and only affects brush and small trees growing within that distance.

1.7.3 ALTERNATIVE 3: NO NEW TEMPORARY ROAD CONSTRUCTION

Direct Effects:

This alternative would follow actions proposed in Alternative 2, with the exception of creating a new temporary road. This analysis mainly affects Units 13 and 14. Because treatment as prescribed in alternative 2 would still be applied to these units using a different skid route, direct effects will not change from alternative 2.

Table 14. Comparison of Alternative 3 with No Action and Alternative 2 – Flame Length

	Fireline Intensity Hazard Rating	Percent of Area No Action	Percent of Area Alternative 2	Percent of Area Alternative 3	Percent Increase or Decrease (-)	
					Compare to No Action	Compare to Alt 2
less than 4	Low	22	92	92	70	0
4-8	Moderate	1	1	1	0	0
8-11	High	1	0	0	-1	0
11+	Very High	77	7	7	-70	0
Total						

Table 15. Comparison of Alternative 3 with No Action and Alternative – Fire Type

Potential Crown Fire Class	Percent of Area No Action	Percent of Area Alternative 2	Percent of Area Alternative 3	Percent Increase or Decrease (-)	
				Compare to No Action	Compare to Alt 2
Surface Fire	18	92	92	74	0
Crown Fire	49	4	4	-45	0
Torching	33	5	5	-28	0
Total					

Indirect Effects:

As described under the Indirect Effects section for Alternative 2, treatments are expected to have a beneficial effect on immediately adjacent, un-treated stands for a short distance.

These units have a high densities of trees in the greater than 10" range that are self-thinning and accumulating as surface fuels that would be very difficult to prescribe burn without mortality to the remaining live trees. These surface fuels would burn with very high intensities if a wildfire occurred. This may cause the potential for a higher level of emission being created during a wildfire.

Cumulative Effects:

Cumulative effects would remain the same as in Alternative 2 except that there would be less of a cumulative reduction in potential wildfire size as compared to Alternative 2.

1.7.4 ALTERNATIVE 4: NO THINNING ABOVE 10"DBH IN RIPARIAN RESERVES

This alternative would follow actions proposed in Alternative 2, with the exception of thinning above 10" DBH in riparian reserves.

Direct Effects:

Analysis was done within Riparian Reserves RR's) showing that stand conditions are very similar compared to areas outside the RR's. Streams, canyons and drainages are typically major fire paths for fires, and it is likely that fires will burn more intensely through the Riparian Reserves as a result. Under this alternative, the Riparian reserves would see more canopy fire (torching and crowning) in most areas than if Alternative 2 were to be chosen. Under Alternative 4, the commercial stands would experience more torching and crown fires than under Alternative 2. The stands would also experience more areas with flame lengths greater than 4 feet than under alternative 2. See tables 16 and 17.

Table 16. Comparison of Alternative 4 with No Action and Alternative 2 – Flame Length

	Fireline Intensity Hazard Rating	Percent of Area No Action	Percent of Area Alternative 2	Percent of Area Alternative 4	Percent Increase or Decrease (-)	
					Compare to No Action	Compare to Alt 2
less than 4	Low	22	92	79	57	-13
4-8	Moderate	1	1	3	2	2
8-11	High	1	0	1	0	1
11+	Very High	77	7	17	60	10
Total						

Table 17. Comparison of Alternative 4 with No Action and Alternative – Fire Type

Potential Crown Fire Class	Percent of Area No Action	Percent of Area Alternative 2	Percent of Area Alternative 4	Percent Increase or Decrease (-)	
				Compare to No Action	Compare to Alt 2
Surface Fire	18	92	73	55	-19
Crown Fire	49	4	8	-41	4
Torching	33	5	19	-14	14
Total					

Indirect Effects:

Since treatments have an effect on adjacent untreated stands for a short distance (see indirect effect in Alternative 2), there may be a loss of benefit to these stands based on expected fire behavior under this treatment.

As this alternative would not remove as many trees/fuel from these units, there will be more fuel left available to burn during a wildfire. This may cause the potential for a higher level of emission being created during a wildfire.

Cumulative Effects:

Cumulative effects would remain the same as in Alternative 2 except that there would be less of a cumulative reduction in potential wildfire size as compared to Alternative 2.

1.7.5 ALTERNATIVE 5: NO THINNING ABOVE 10"DBH IN NSO NESTING HABITAT

This alternative would follow action proposed in Alternative 2, with the exception of thinning above 10" in known NSO nesting habitat.

Direct Effects:

Under Alternative 5, the commercial stands would experience more torching and crown fires than under Alternative 2. The stands would also experience more areas with flame lengths greater than 4 feet than under alternative 2. See tables 18 and 19.

Indirect Effects:

Since treatments have an effect on adjacent untreated stands for a short distance (see indirect effect in Alternative 2), there may be a loss of benefit to these stands based on expected fire behavior under this treatment.

As this alternative would not remove as many trees/fuel from these units, there will be more fuel left available to burn during a wildfire. This may cause the potential for a higher level of emission being created during a wildfire.

Table 18. Comparison of Alternative 5 with No Action and Alternative 2 – Flame Length

	Fireline Intensity Hazard Rating	Percent of Area No Action	Percent of Area Alternative 2	Percent of Area Alternative 5	Percent Increase or Decrease (-)	
					Compare to No Action	Compare to Alt 2
less than 4	Low	22	92	91	69	-1
4-8	Moderate	1	1	1	0	0
8-11	High	1	0	0	1	0
11+	Very High	77	7	8	69	1
Total						

Table 19. Comparison of Alternative 5 with No Action and Alternative – Fire Type

Potential Crown Fire Class	Percent of Area No Action	Percent of Area Alternative 2	Percent of Area Alternative 5	Percent Increase or Decrease (-)	
				Compare to No Action	Compare to Alt 2
Surface Fire	18	92	89	71	-3
Crown Fire	49	4	6	-43	2
Torching	33	5	5	-28	0
Total					

Cumulative Effects:

Cumulative effects would remain the same as in Alternative 2 except that there would be less of a cumulative reduction in potential wildfire size as compared to Alternative 2.

1.8 SUMMARY OF EFFECTS

Alternative 2 would have a substantial reduction in flame lengths greater than 4 feet and a substantial reduction in acres experiencing canopy fires versus surface fires when compared with the no action alternative. Under Alternative 2, there would be the most reduction in crown fire potential as compared with the no action alternative. Alternative 2 would have the most reduction in loss of LSR habitat in the event of a wildfire. The ability of firefighters to safely and effectively suppress wildland fire would also be improved with implementing Alternative 2. The selection of this alternative would contribute to the purpose and need, the desired condition, forest plan direction, and respond to the National Fire Plan goals of reducing hazardous fuels to modify fire behavior.

Alternative 3 (in comparison to alternative 2) would have 0% less of a reduction in flame lengths greater than 4 feet and 0% less of a reduction in acres of canopy fires after treatment. Alternative 4 (in comparison to alternative 2) would have 13% less area experiencing <4’ flame lengths and 15% more areas experiencing canopy fires after treatment. Alternative 5 (in comparison to alternative 2) would have 1% less areas experiencing <4’ flame lengths and 2% more area experiencing canopy fires after treatment. Comparison of Alternatives 3 through 5 to alternative 2 was done to the units that are proposed to have commercial treatments only. Net effects of treatments to adjacent units was not modeled because of the limitations of the FlamMap model. Treatment of these units do have an effect in reducing fire behavior in adjacent stands.

1.9 COMPLIANCE WITH LAW, POLICY, REGULATION, AND FOREST PLAN

MENDOCINO NATIONAL FOREST LAND AND RESOURCE MANAGEMENT PLAN DIRECTION

Land management activities on the Upper Lake Ranger District are directed by the Mendocino National Forest (MNF) LRMP (USDA 1995) specifies forest-wide standards and guidelines, as well as area-specific guidelines. Regarding fuel treatment and fire hazards, it directs (Section IV- Management Direction: Fire and Fuels, pg 21):

8. Treat fuels to reduce the potential rate of spread and fire intensity so the planned initial attack organization can meet initial attack objectives.

The proposed actions comply with this direction by reducing fuel loading below what is considered to be the upper limit of what can be addressed using direct attack suppression tactics (See sections XXX of this report).

10. Emphasize fuels treatment efforts for fire hazard reduction purposes in the following areas:

Natural Fuels (d): forested areas with excessive accumulations of natural fuels.

Activity Fuels (b): where treatment is necessary before initiating other multi-resource management projects, e.g., reforestation.

Manage National Forest activities to maintain air quality at a level which meets or exceeds State and/or local government regulations.

All prescribed burning is coordinated with and approved by Lake County Air Quality Management District to ensure that state and local air quality objectives are met.

Provide for protection from wildfire, through timely detection and suppression response with appropriate forces, such that cost plus net resource loss due to wildfire is minimized. All wildfires will be contained, confined, or controlled in accordance with specific management area direction.

Proposed action would create treatments that after completion, is expected to reduce cost of wildland fire responses as well as reduce resources loss due to potential wildfires. After project completion, the project area will be in conditions that will allow for a more efficient and safer suppression response.

Emphasize fuels treatment efforts for fire hazard reduction purposes in the following areas:

- ***Natural Fuels: Continuous, mature brush stands of more than 150 acres adjacent to or within areas of urban interface, resource investments, or high fire hazards;***
- ***Continuous, mature brush stands more than 25 years old;***
- ***Continuous, mature brush stands with dead-to0live ratios greater than 35%***
- ***Forested areas with excessive accumulations of natural fuels***

Activity Fuels:

- ***In zones of urban interface of other high hazard areas;***
- ***Where treatment is necessary before initiating other multi-resource management projects, e.g. reforestation***

Brush burning is proposed primarily in large continuous, mature brush fields on the western side of the project. The project would treat excessive accumulations of natural fuels.

Design fuel treatment and fire suppression strategies, practices, and activities to meet Aquatic Conservation Strategy objectives, and to minimize disturbance of riparian ground cover and vegetation...

No machine piling would occur in riparian reserves; Hand Piles (if created) would be located a minimum of 25 feet from the high water mark, unless on a topographic break (flat or bench with slope <20%). The small sizes and scattered arrangement of hand piles minimize disturbance to ground cover and vegetation.

Integrate multi-resource management objectives into fire hazard reduction efforts. Design prescribed fire projects and prescriptions to contribute to attainment of Aquatic Conservation Strategy objectives.

The fuels reduction treatments in the Proposed Action will assist in long-term maintenance and protection of the Riparian Reserves and will attain ACS objectives. Potential short term impacts are minimal due to design features and BMPs.

Consider the particular needs for the specific vegetative communities and sensitive plants where prescribed burning is used as a vegetation management tool (e.g. within the 'shrub hardwood" type). Vary or adjust the frequency, intensity, and timing of prescribed burning proposals as necessary to protect specific vegetation types, botanical diversity, and the viability of sensitive plant species.

The proposed action would use fire as a vegetation management tool for shrub and hardwoods. Having the use of Spring and Fall burning (as proposed) would allow for varying intensity and timing of prescribed burns that would help meet project goals. The purpose and need describes the existing and desired conditions of these vegetative communities.

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APPENDIX A – MAPS

Figure 12 - Condition Class

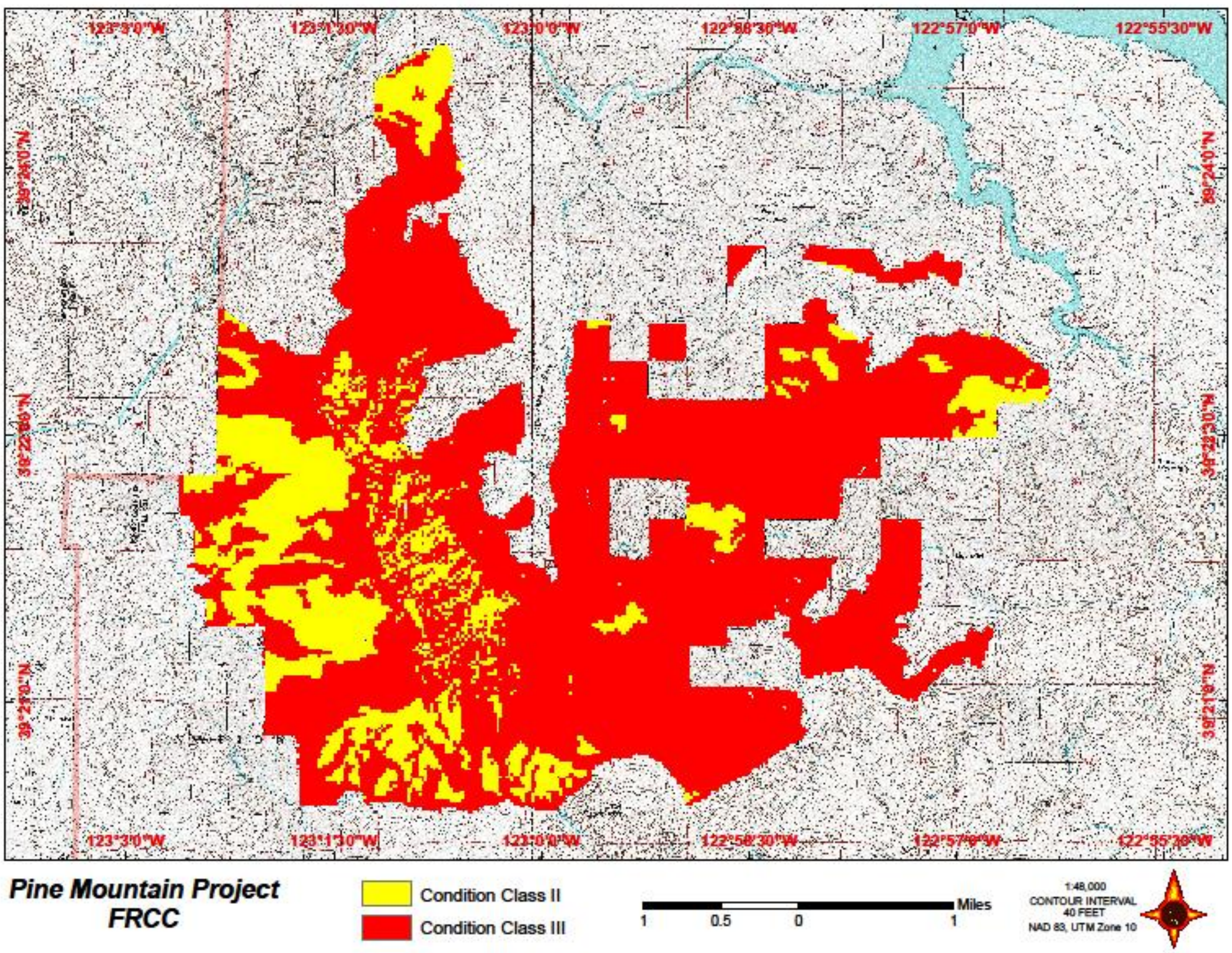


Figure 13 - Fire Activity Type Current Conditions

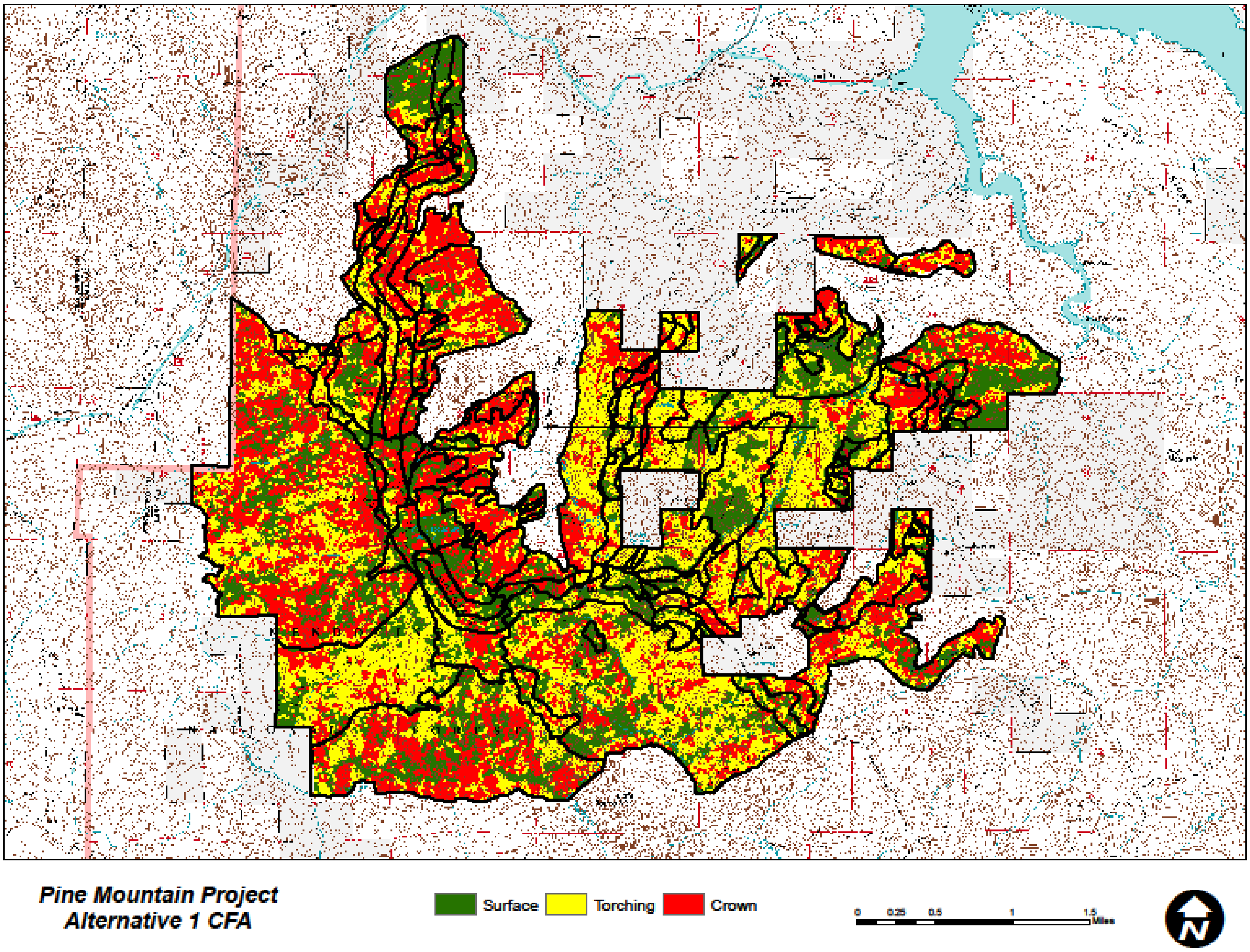


Figure 14 –Flame Lengths Current Conditions

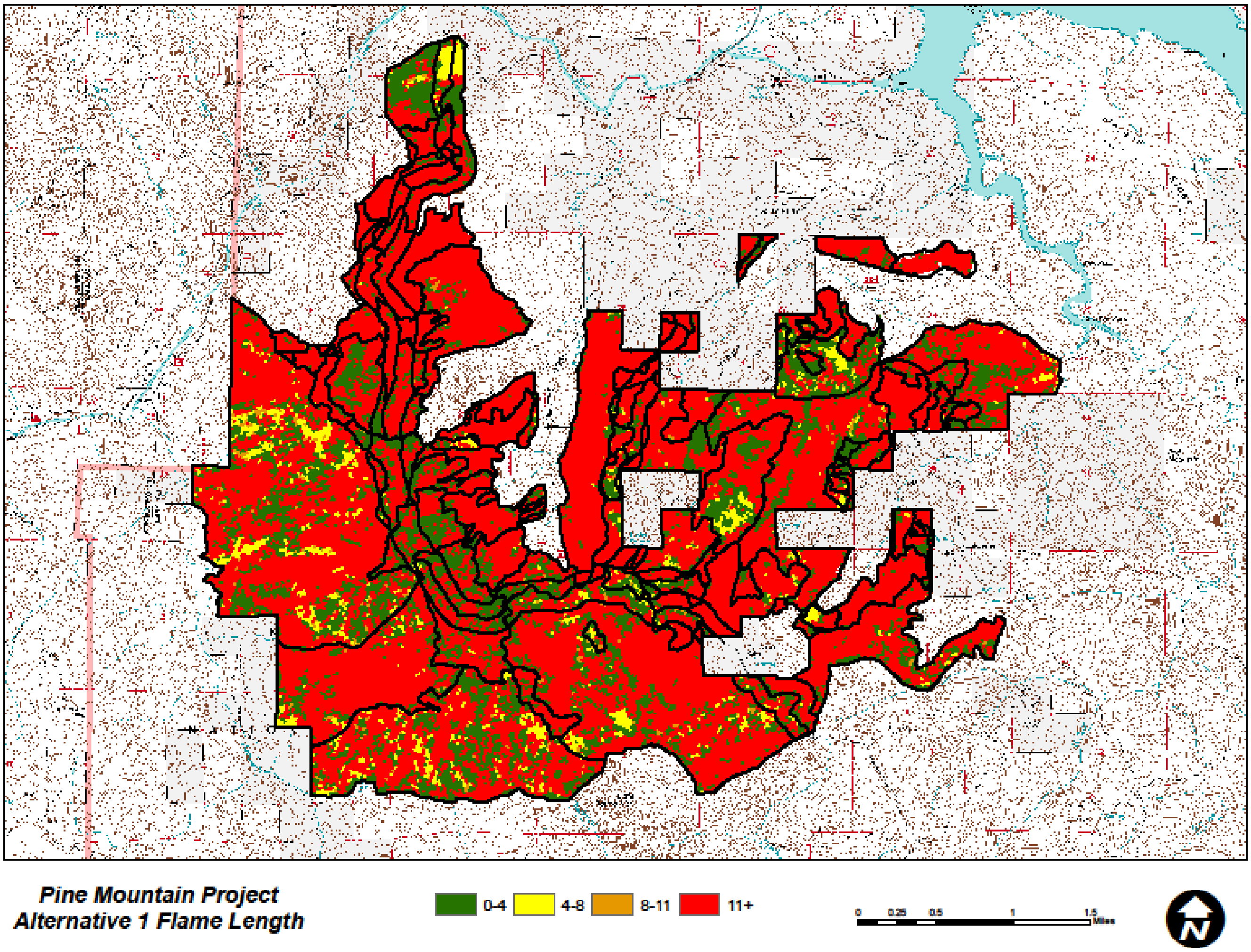


Figure 15 – Alternative 2 Fire Activity Type

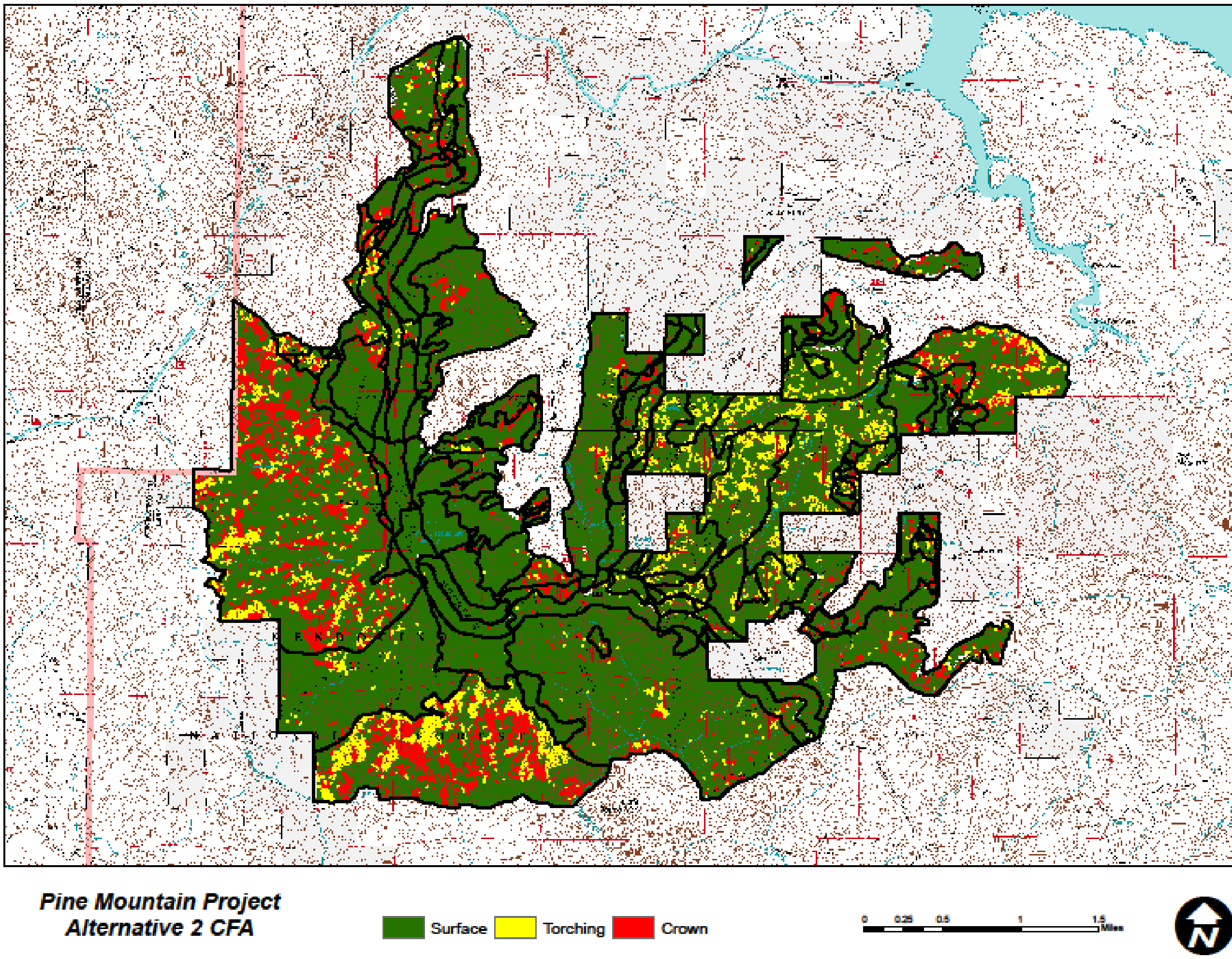
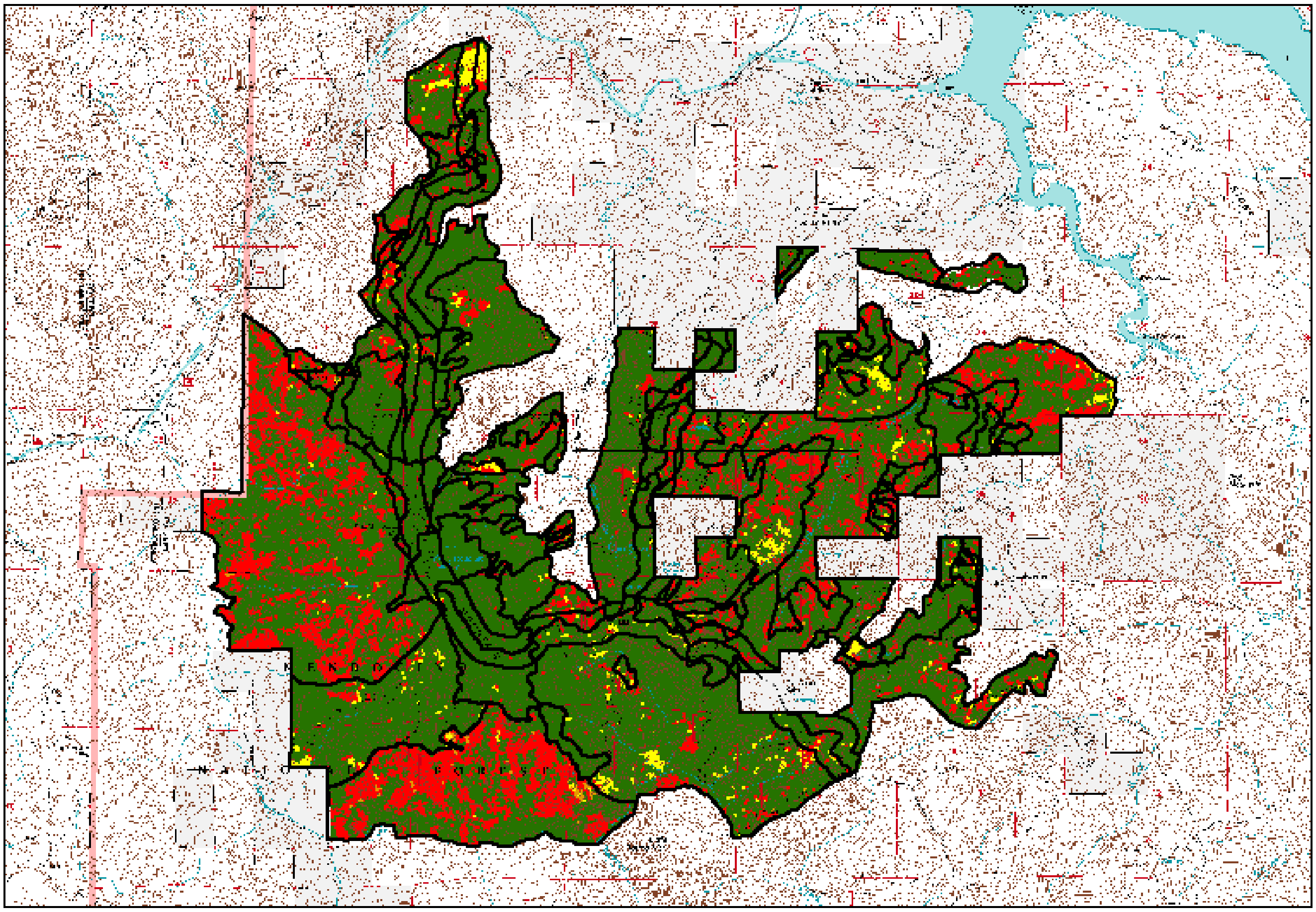


Figure 16 – Alternative 2 Flame Lengths



Pine Mountain Project
Alternative 2 Flame Length

0-4 7-8 8-11 11+

APPENDIX B - Terminology

Canopy Fires – Fires that burn most of the live canopy of the vegetation (trees or brush)

Crown fires - The movement of fire through the crowns of trees or shrubs

Flame Lengths - the distance measured from the average flame tip to the middle of the flaming zone at the base of the fire

Fuels - Combustible material. Includes, vegetation, such as grass, leaves, ground litter, plants, shrubs and trees that feed a fire.

Ladder Fuels - live or dead vegetation that allows a fire to climb up from the forest floor into the tree canopy

Surface Fires – fires which spread with a flaming front and burn leaf litter, fallen branches and other fuels located at ground level

Surface Fuels - Fuel lying on or near the surface of the ground and consisting of leaf and needle litter, live and dead branch material, downed logs, bark, tree cones, and herbaceous material of low stature

Torching: The ignition and flare-up of a tree or small group of trees, usually from bottom to top